

SOUTH FROM THE RED SEA

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Part One

IN THE RED SEA WITH *CALYPSO*

Chapter One

HEAVY WEATHER

"AHoy THERE! DUPAS!"

From the bridge, the voice of Captain Cousteau rang down the port gangway. "Send up three professors! Two to scrub down the bridge, one to help at the telegraph!"

The *Calypso*, newly painted white, rolled her 380 tons on the green waters of a stormy Mediterranean. She had left Toulon two days earlier, and was heading for the Red Sea on a voyage of oceanography; that is why you could find among the crew a chemist, a physicist, a biologist, a geologist, an engineer, a diver, a doctor, even a parachutist and a cinematic photographer. This collection was commonly referred to by the genuine sailors as the "professors". For there *were* also genuine sailors and, together with Captain Saout, the Chief Engineer Montupet, Beltran the quartermaster, Martin the electrician, Sauvage the wireless operator, Léandri the engineer and Hanen the ship's cook, we were twenty on board. What the ship lacked, however, was ordinary seamen—for the simple and perennial reason that the expedition had not the funds to engage them.

Because of this our scientific experts had to abandon from the first any idea they might have cherished of being on a pleasure cruise. The breaking-in process had begun even before we set off: two long days of carting equipment over the stony quays of the Arsenal had already turned these intellectuals into something like ordinary men. And now they kept their watch like old hands.

Dupas' head appeared through the half-open door of the cabin.

"Monsieur Cherbonnier, someone's wanted to scrub down the bridge."

Cherbonnier, forty years old, zoologist at the Museum of

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Natural History, put away the book that he was trying to read against the rolling of the ship. I could see his legs hanging on a level with my face as he jumped down from the upper bunk.

"Caught again! Blast that Dupas."

He wedged himself in the narrow space between the bulkhead and the bunk, pushed back the heavy lock of black hair which kept falling over his eyes, lit the eternal cigarette sticking to his lip, and began to pull on his clothes.

The ship tossed more and more, and I felt a voluptuous pleasure at being left in peace, warm and dry under the blankets. My companion meticulously buttoned his coat to the chin, pulled on his rubber boots, crossed the cabin in two strides and reached for the handle of the door. "Lucky dog!" he said enviously. "Sleep well."

A wave slapped the ship violently as he went out. A shower of spray rushed in, flooding the cabin floor.

To sleep was not easy. The sea was becoming so rough that you had to make an effort not to be tipped out of your bunk. But I was dead tired. There was more than the ordinary work of the ship to be done because the *Calypso* had put to sea before everything was ready, so that cleaning up and getting things in order were relentlessly added to our regular duties. People on land would hardly imagine the vast amount of rubbish and filth that a ship in dry dock can accumulate. Fortunately ships are able to use the whole ocean as their dustbin, and we soon learnt the pleasure of throwing things overboard—one way of getting rid of lumber irrevocably and without regrets.

It was after we entered the Ionian Sea that we felt the full fury of the storm. Hardly had we doubled Cape dell'Armi at the very toe of Italy, than the north wind fell on us in squalls sharp with the cold of the Yugoslav mountains. The time was the end of November, 1951, and the winter that year was severe.

The *Calypso* is a one-time minesweeper turned into an oceanographic research vessel. I don't know if it is a characteristic of all minesweepers to roll like an egg on a table at the least movement of the sea's surface, but our *Calypso* certainly possessed this trait to an extreme degree. And now the tempest made us pitch as well as roll. The bitter wind hollowed out the green water into hurrying waves, deep as gulfs. The boat took

the sea on its side; it might have been a stubborn plough as it laboured through the immense green chaos scattered with mad white crests.

In the course of the night the sea began to gather strength again, and when I left the cabin to take my watch I felt for the first time vaguely sick. It is a disagreeable feeling to become conscious of one's organs: the heart, or the stomach. I climbed the ladder and leaned over the rail on the outer wing of the bridge, on the windward side; soon the fresh air and the violent spray had dispelled the odd sensation.

Saout, the officer of the watch, was still at the helm. Standing solidly, his short legs apart, his hands firmly grasping the wheel, a cigarette stub travelling from one corner of his lips to the other, he examined the night phlegmatically through the port-hole before him, though at every moment he was drowned in angry showers of spray. That is what this business of the watch amounts to: keeping a vigilant look-out over the sea, left, right and ahead; watching for the signal lights of some other ship; peering for four hours at a time into the opaque confusion of air, water, rain and spray flung up by the cold wind; knowing the perpetual fear of a ship's light suddenly bearing on you out of the watery blank—a danger that has to be dealt with immediately by very careful manœuvring.

Only now there were no lights, no ships. We were alone in a black world, and after a time the strain on the eyes and mind of all this concentration—an empty and monotonous occupation at best—became intolerable.

Lashed by the cold wind and water, wedged firmly into the corner of the bridge, now that my sickness was gone I felt a part of the ship itself. A kind of exhilaration rose in me at the thought of the *Calypso*, our dumpy little boat, stubbornly persisting in her rough journey against such tremendous punishment.

The greenish reflection of our position lights shone eerily on the forward deck, a pallid triangle of bare boards, swept first by the impetuous torrents as they plunged down into cavernous gulfs then, as if lashed from behind, rising again on the slope of a moving mountain, pointing in the direction of still more menacing clouds. Sometimes it seemed that the keel had no more grip on the water. Moments stretched out; the suspense

was agonizing. Rocking from stem to stern, the ship forced herself against the seas. Then a tremendous uppercut shook the vessel and held it up for a moment just as a blow of this kind can stop the rush of a boxer. And it was like a valiant boxer returning to the attack that the *Calypso* snorted and plunged back into the battle.

The wind whistled through the tense cables, shrieked with increasing rage, then lowered its voice, following no one knows what extraordinary score. From time to time it sank into unbelievable silences. Then, far away on the left towards the north, you could hear the mad music starting anew, gradually increasing in force until its uproar swallowed yet again our tiny solid universe.

The men on the bridge have the job of entering in the log-book any unusual incidents during their turn on duty: ships crossed or overtaken, islands, capes, beacon lights, recognizable points on the coast, changes in the wind's direction, the regular or irregular behaviour of the engines, possible variations of the gyroscope discovered by periodically taking bearings from the Pole Star—and other such matters. On the chart—the marine map like a photographic negative of an ordinary map, all its writing being on the seas, the land being left empty and white—the position of the ship, whether measured or estimated, is put down. An exacting little piece of work, this observing and recording; but it provides a not unpleasant break in the monotony of the watch.

On this particular night, however, except for the storm nothing of interest was happening. Simply, at each hour, the sailor on duty had to go to the extreme end of the ship to read the log, and set down in the book the bearings noted. The log itself is a beautiful little instrument of copper, shining and compact. Torpedo-shaped in front, screw-shaped behind, it is drawn along in tow fastened by the nose to a very long cord. The faster the ship goes, the faster turns the log, together with its cord; this in its turn drives a comptometer fixed on the gunwale, so that one can tell both the speed of the vessel and the distance travelled. The state of the water has to be taken into consideration, and certain corrections may need to be made to allow for currents and tides. But on stormy nights, when there

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are neither stars nor land-lights to be seen, you have only the log to rely on for gauging position.

Because of the great risk of being swept overboard ropes had been stretched across the quarter-deck to give a grip to the men who had to venture there. There was no hand-rail, and you had a magnificent view of the raging water spattered with whitish foam as you hung on to the rope and leaned over the little self-registering dial of the log, less than two yards from that tormented surface which heaved and rose as if to swallow us up. To travel as far as the log and back was a form of physical exercise which gave us the same kind of pleasure and incentive as rock climbing, and soon we had all learnt the basic technique; this lay in anticipating the ship's response to a coming wave so that you could keep steady at the violent moment of impact, and in remembering to progress in large strides, arms stretched out, during the brief moments of calm.

This night my customary resistance to sea-sickness was to suffer defeat. At the end of the third hour of the watch I found myself in the chart-house bending forward over the high table on which the nautical maps and the log-book were spread out and was contriving to write out the figures in the indescribable combination of movements and shakings which was the *Calypso's* peculiar gait. I had only time to drop pencil and book, leap outside and lean over the rail. The physical relief was great; but so was the mortification of having succumbed.

The watch ended, I went down the ladder and took a zigzag course along the gangway, tossed about violently between the bulkhead and the hand-rail. I waited till the next wave had broken, then slipped into the cabin, slamming the door behind me before another wave could follow. Already my stomach was heaving again, and I was overcome with anguish and disgust.

"Your turn, Cherbonnier!" I pulled off my soaked clothes and dropped down on the bunk.

"It seems to be rough up there!"

Cherbonnier, by some miracle immune to sea-sickness, was one of the four men who never experienced it at all during our two months at sea. He slid down from the upper bunk, his cigarette already lit, and began to put on his clothes.

He had grown thinner. Three days had been enough to work off the layer of fat which his naturally fatherly figure had acquired in the course of a sedentary life in a laboratory. Now doggedly applying himself to the rough new job of being a sailor, he had recovered the figure he had at twenty.

Cherbonnier gone, I closed my eyes, wanting only sleep and oblivion. But with my right hand clutching the edge to keep me from being thrown out by the ship's rolling, and with the muscles of my body having to work all the time to maintain a precarious balance, I realized the vanity of hoping to sleep. I opened one eye. Cherbonnier had left the light still burning over the wash-basin: hanging on the partition facing me, now swinging to the left, now stark and still, now swinging to the right, my clothes brought into the closed world of the cabin a disquieting awareness of the real horizon. I shut my eyes tightly, but the temptation was too strong: my left eye opened. The pitiless automatic motion went on without respite. In actual fact it was not the clothes which swung. The long overalls, the trousers stiff with salt, stayed as vertical as the needle of some enormous gradient indicator: it was the walls of the cabin that went up and down, thirty degrees to one side, forty degrees to the other. My half-opened eye strove to believe what the lucid remnant of my brain was telling it, but to no avail: a phantom fixed to a hook, the khaki coat for ever swept the white partition. Several times I shut my eyes to escape from that infernal pendulum; but just as one goes on prodding a bad tooth with the tongue, I could not keep myself from gazing at this oscillation which made my stomach heave to the point of nausea.

Towards five o'clock in the morning the humming of the engines suddenly began to die down, then stopped altogether.

The silence thrust itself like an intruder into the familiar hubbub. For the past three days the furious throbbing of the diesels had become so familiar to us that we were no longer even aware of them. But the silence we could actually hear.

The pitching stopped immediately, but the rolling increased to such a degree that the hanging clothes in the cabin were sometimes almost horizontal. Bruised and buffeted, the boat lay athwart the waves, those short hollow aggressive waves of

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the Mediterranean in anger; they caught the *Calypso* on the side, played with her like a cork, and threatened at any moment to make her capsized. There was no need to be a seasoned sailor to realize the gravity of the situation.

"Perhaps they'll need another hand on the bridge," I said to myself; "perhaps I should go and see. . . ."

Bracing myself with elbows and knees in the narrow space of the bunk I resisted the efforts of a hostile element to throw me out of it. A still more violent shock sent swimming into the seething brine all the objects that were not absolutely fixed. Two or three books, a Rolleiflex, the metal box containing the Geiger counter, all bounced on to my outstretched legs, then joined the mad company of soaked cigarettes, toothbrushes and electric torches in the unholy broth.

Should I get up? Should I offer to help? Yes, I certainly should. . . . But what good should I be, empty and racked with sickness?

Another fit of rolling seemed to herald an immediate catastrophe. My mind worked feebly. . . . Must put on trousers. Can't be shipwrecked with nothing on. . . . The effort seemed too much to contemplate. Well, let the ship go down. Who cares! At least it would put an end to this ignominious prostration.

On the quarter-deck, which was swept by furious waves, Cousteau directed emergency measures: the assembling of a floating anchor to steady the boat until the engines could be made to work again. The valves of the diesel were blocked, the narrow pipes choked by the sludge from the bottom of the tanks which the tempest had shaken up into the heavy oil. Hanging by a foot to some steel rod, clinging with their elbows and even foreheads, Montupet and Léandri strove to unscrew the various pipes, to clean them out and put them back in place; while the watch on deck worked furiously at making the floating anchor—a kind of solid raft that is dropped overboard fastened at the very end of a long and particularly tough hawser, so that it stands vertically under the surface of the sea and resists to some extent the drift of the ship. In fact, it is a kind of horizontal parachute whose purpose is on the one hand to keep the vessel from drifting too much off her course

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through the violence of the wind and the waves, and on the other, to keep it afloat.

In calm weather, the *Calypso's* quarter-deck hardly rises more than two yards above the water. On that night it might have been the bridge of a submarine, so drenched was it by the furious heavy seas. Wet through for all their sca-boots and sou'westers, tied with rope in order not to be carried away, the men struggled to trim the spars and planks. The wind increased; the sea shook the vessel in every direction: its forty yards of length seemed very small in the middle of the great green gulfs flecked with the foam and spray that the squall tore from the wave-crests and drove horizontally in its race.

For more than an hour the crew had two battles on their hands: one fought by the mechanics in their black cavern filled with the nauseating smell of gas-oil; one by the scamen in the raging storm above.

Through the cruel night, hands bleeding, fingers stiff with cold, each man worked in silence with a desperate concentration. All their strength, all their thoughts were bent to the task. It would have been fatal to waste time or movement in doing any action twice. So far the ship was holding its own. The deepest hollows, the most brutal lashing of the waves had not yet made it founder. But how long would the miracle hold?

At last the floating anchor was ready. There only remained the job of passing overboard the half ton of wood and rope that formed our home-made lifebuoy. Before this final thrust the exhausted men were pausing to recover their breath, when they heard through the howl of the wind a longed-for but unexpected sound—the engines starting up.

Chapter Two

THE WATER ROAD

PORT SAID! FOUR O'CLOCK in the morning. We are at our stations ready to carry out the orders for going into harbour. The yellow lights of the town shine like stars on the dark horizon. A craft almost the size of our own cockle-shell comes up alongside. The pilot grips the ladder, steps on board and the craft moves off. We set out again at a gentle speed, judging our position by the stars. Motionless buildings pass us, lights of beacons, moving steamers. At the wheel, Frédéric Dumas steers under the orders of the Egyptian pilot, a fat man with a disdainful underlip, bundled up in his overcoat of navy blue cloth, a stylish cap carefully placed on his head. Behind them stands our captain, his hair ruffled, a mackintosh tied round the waist over his pyjamas. It amuses me to see these two thin Frenchmen, dressed in anything that comes to hand, on either side of the rather too fat and rather too well-turned-out Egyptian.

Nor does our Egyptian friend seem any too happy. At each discourteous remark that he drops Dumas' lips are pursed just a little more; evidently this pilot takes him for some sailor or other on duty, and talks down to him accordingly. Surely it is not such a difficult passage? Yet they have to make two, no, three, attempts to do what seems to my inexperienced eye a simple enough matter. But I tell myself that I know nothing of these things; appearances are deceptive, anyway.

Several times already a tug-boat has passed close to us, a sort of water-taxi on the prowl. Here it is again. . . . From our bridge the pilot hails it with the signal light and enters into heaven knows what communications. Then he turns to Cousteau:

"We'll have to use the tug. I can't guarantee that we'll get through otherwise."

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A brief discussion follows of which I catch only odd words; it ends with a firm but polite refusal from Cousteau.

Very much put out, the pilot starts muttering; then works himself into a rage against Dumas. "I suppose he thinks he can steer, that fellow!" The working of the ship slows down even more under the erratic control of the pilot (or, according to the pilot, the bad seamanship of the crew).

Under the quizzical eye of Cousteau, Dumas begins to show his exasperation: with set jaw, eyes fixed on a point beyond the wheel, he is clearly on the verge of exploding with rage—when after all we come alongside the quay. We have done this in spite of the ill will of the pilot who would have so much liked to make us use the tug. Towing is expensive, and a tidy little commission can be made on the deal.

We passed two full days at Port Said, where the damage caused by the storm had to be repaired.

Port Said, Gateway to the Orient, is no more than a flat commonplace town in which the unsophisticated tourist can buy for twenty times their worth "souvenirs" of Egypt or even of Arabia; these range from shoddy leather goods and filigree silver work to frightful carpets woven in aggressive reds and poisonous greens representing a languid houri, or the eternal camel in front of the eternal pyramid.

Fortunately the damage to the ship was not serious. It was the part we called the "false nose" which was most affected. This was an outer layer of strong sheet-iron fastened round the stem; a free space was left into which a man could insert himself and creep down to a sort of niche where it was possible to lie flat. Once ensconced there, two and a half yards under the surface, you had—through five portholes arranged crosswise—a magnificent field of vision. Whether the ship was in motion or stationary, it was an ideal observation post for submarine life.

I shall never forget the extraordinary spectacle that I once beheld as I lay in this false stem during the crossing of the Tyrrhenian Sea.

Two feet in front of my eyes, a little above me, rushed four magnificent dolphins. They might have been a fiery submarine team drawing the ship. Their silvery undersides kept flashing into light in the miraculously clear blue of the water.

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Sinuous, strong, mercurial, like a team harnessed to some mythological four-horse chariot, the elastic and powerful bodies leapt with an astonishing speed. From the heart of the mêlée, one of them would sometimes rise, cut through the quicksilver surface, disappear for an instant as if dissolved in air, then, its leap done, would glide again among the other coursers in the marvellously deep azure of the sea.

After the storm, unfortunately, it was no longer possible to use the false stem, as a leak had appeared. During the day off that we allowed ourselves after the hard night, and which we spent in a sheltered creek on the southern side of Crete, Dumas had gone down to see how the curious appendage built on to the *Calypso* was behaving. This false nose, which had excited considerable criticism among experts at Toulon and elsewhere, had just been put to a severe test. Those experts had not been lenient. "It can't hold. . . ." "It'll break off at the first heavy seas. . . ." "It'll slow down the ship." From the first day at sea we had been reassured on the question of speed: the loss was practically imperceptible, and the ship easily made its twelve knots. But its soundness was another matter, and about that we were anxious. So Dumas had gone down equipped with a *narghilé*, a simple but effective form of diving apparatus in which the air, under pressure, travels down from the surface to the diver by a ringed rubber tube, whose specially modelled end he holds between his teeth. This makes him look as if he were smoking a Turkish water pipe.

For five long minutes we stayed, gripped with anxiety, leaning over that dark well. At last Dumas reappeared; dripping wet, he climbed the hanging ladder, unclenched his jaws to get rid of the mouthpiece of the *narghilé*, and announced to us that the water had risen to the outside level.

"Your false nose had a cold," remarked Cherbonnier teasingly, his dark hair ruffled by the north-wester.

"It's only a false cold," was Cousteau's quick reply.

In fact the leak was very slight: a faulty piece of welding had given way at the point where one of the rungs was fastened to the false stem. But this little hole was enough to hold us up for two days in the boredom of Port Said.

The Canal, an avenue of water, neat, gleaming, precise,

looks like a motor highway between two deserts of sand. On the west bank, however, the desert does not begin immediately; parallel to the canal on that side are a railway and an asphalt road. Only beyond that is the sand. But on the east side the desert spreads out right from the upper edge of the sloping bank—an endless expanse of bright ochre.

It is one of the few places in the world where you can see moving along in parallel procession, each a few yards from the next, the latest model of car, a steam train, a sea-going ship and a slow procession of dromedaries taking their unemotional way. These forms of transport, you might say, are arranged from west to east in order of decreasing speed: a curiously symbolic opposing of the enveloping west, so hurried, so terribly contemporary; and the pre-Biblical east, never changing its character through the centuries.

I remembered my first journey through the Canal. It was a time of peace. British soldiers bare to the waist were playing football; others sitting on the banks made friendly signs to the women in the passing liners. Now all was barbed wire; guns ready for action, armed and helmeted troops. These soldiers no longer made the first sign, but when we hailed them they responded suddenly, as if surprised, with enthusiastic waving: they must have been feeling isolated in a hostile country, and the friendly greeting of the French warmed their hearts.

These unusual reactions were not the only signs of Anglo-Egyptian tension. We passed a train that once had carried war material: now its overturned trucks lay under their load, their cargo of light tanks in the sand; twisted guns were driven into the earth. Sabotage. . . .

Of sabotage I had seen nothing since 1944. I still remember our savage joy at hearing the roar of the derailling as we sped into the nocturnal forest to escape the German fire. Here, too, the Egyptian partisans must have exulted in the success of their attack. They, too, were fighting to drive foreign forces from their country. And yet, as we looked at the mutilated train, instead of sharing their joy, instead of feeling a kinship with men so like our former selves, we found that our sympathies were with the English, and we almost shared their anger.

"All Europeans are fellow countrymen when far enough from home," wrote La Pérouse, in 1788, about the clash with

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an English squadron in a bay of New Holland. At the Canal there was something else as well. A sentiment which had nothing to do with Europeanism or racial prejudice worked against the sympathy we should have felt for the Egyptian resisters. It was, if I may call it so, a kind of anxiety about the fate of this scientific marvel brought to life by French engineers; a fear of what might happen in less expert hands to this perfect bridge of water uniting two worlds across a desert. Moreover, in this region, this narrow strip lost in the desert where none had ever roamed but a few nomad Bedouins, was not this Canal first built by the French and then maintained by the British? Hadn't they turned it into a district of value to all the world, certainly profitable to Egypt itself?

I could not help thinking that a very little more justice in the sharing of wealth and land would have done infinitely more to ameliorate the lot of the wretched fellahs than taking the control of the Canal from the Europeans.

At Suez there was a skirmish on the day we cast anchor. Forty-three dead. As usually happens, these men had died for interests that they knew nothing about and which were none of theirs. *Vos sed non vobis*.

Not far from us lay a destroyer of the British Navy, the *Chivalrous*. Dumas pronounced the name as it looked to the eye, in a Toulon accent moreover: *Chivalroû*. Although it was Sunday the morning cleaning-up was in full swing. Ratings were sweeping, scrubbing the bridge, polishing the shining brass. It was as peaceful as a barracks scene in spring. But a fully armed guard marched up and down before the gangway, and the guns, freed from their coverings, were at the ready. We seemed to puzzle the British crew. The men gazed at us with an astonished air, and we even saw an officer hiding behind the superstructure and observing us through binoculars. Their perplexity must have been great, to make an officer of the Royal Navy so far forget his reserve. But the *Calypso* had something to intrigue them with; her appearance, for one thing, which was half warship, half pleasure cruiser, and all white from the fresh paint we had laid on three days ago. There was also the motley effect of her crew. Here was a captain of the most dignified presence wearing the handsome uniform of a Captain of Corvette, which he kept for official visits on land;

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but here, too, were some typical old sea wolves like Saout, Beltran, and Montupet, as well as a bizarre fauna of individuals rigged out in the most unorthodox fashion, some in shorts, others in flannel trousers, some in bathing slips. And all this little community seemed to live on an equal footing of the most democratic kind: that bearded man, for instance, splashed with white paint and brush in hand, was chatting amiably with the commander of the ship himself. This was more than enough to upset the Royal Navy—to say nothing of the incomprehensible false nose!

If we were an object of interest to the British sailors, we ourselves felt equally attracted by the vessel moored on our left: a Norwegian cargo boat on the bridge of which had just appeared from between-decks two ravishing lady passengers. It was the sight of them that reminded us for the first time of the potential danger of sharks; for, after it had been estimated that the ship could be reached in two minutes by swimming, the question arose whether in that short time a shark would launch an attack. In the end, it was not the sharks which kept the young oceanographers of the *Calypso* on their own vessel, nor even their total ignorance of the language of these charming girls, but the prosaic fact that the water lying between was really too filthy. The Hellespont where Lord Byron took his dip must surely have been cleaner.

Chapter Three

A DIFFICULT VISIT

DAY WAS BREAKING when we passed Mount Sinai, almost dissolved in the dusty orange mist of the sun. On our right, a massive high cliff, old rose in colour, ran from north-west to south-east until it disappeared from view, an immense wall of tawny stone abruptly cutting off the African continent.

All these long marine hollows—the Gulf of Suez that we had just traversed in all its length, the Gulf of Akabah which sinks down to the north of the other side of the Sinai Peninsula, the Red Sea towards which we were making—are a result of one of the most tremendous accidents which have ever affected the surface of the globe.

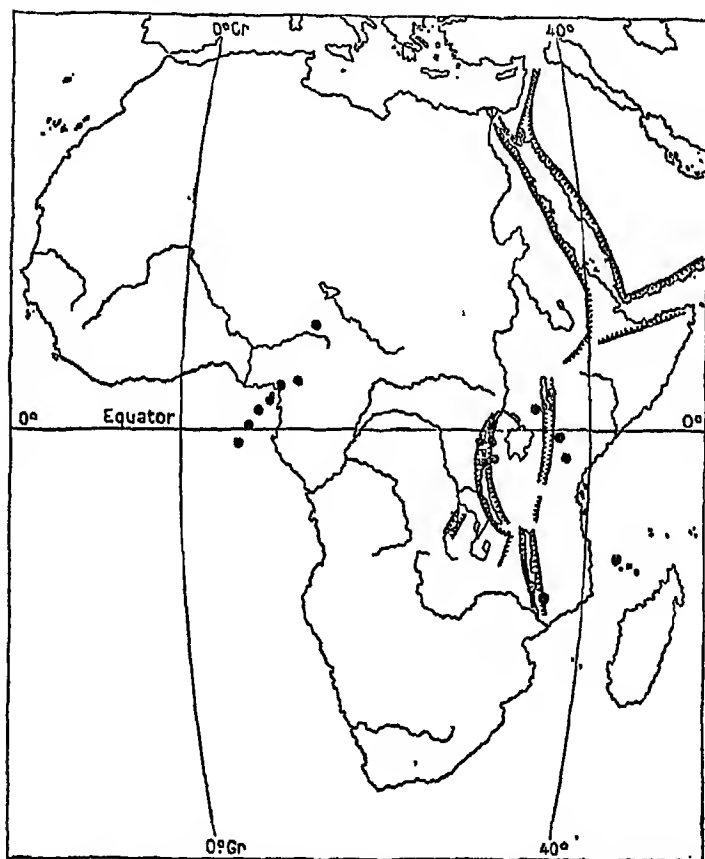
In the course of the period that the geologists call the tertiary, that is, some millions of years ago (the age of the earth, from the time of its solidifying, is about three and a half to four thousand million years), the terrestrial crust suffered an enormous longitudinal crack: as a result a colossal trough or furrow stretched in zigzags on both sides of the 35th meridian—from the mountains of Taurus in Turkey to Lake Nyasa in East Africa, from the 35th or 36th parallel north to the borders of the 20th parallel south, over nearly six thousand miles. The only thing of comparable importance to these great gulfs are the gigantic foldings which have raised to heights of thousands of yards parts of the sea-bed formerly lying several miles below. One of these foldings has produced the prodigious range of mountains running from the Alps to the Himalayas; from another come the immense cordilleras of the American continent.

We may well speculate on the original cause of such upheavals in the earth's surface.

Since Horace-Bénédict of Saussure, nearly two hundred years ago, remarked that the highest mountains were formed

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from sediment accumulated in the seas, there have been many attempts to explain the phenomenon. It has been attributed to a shrivelling of the earth's skin as it cooled. But there is a serious objection to this hypothesis; for if the superficial part of the earth grows cool through the radiation of calories to-



The principal rifts and volcanoes (black dots) of the African continent

wards the interstellar spaces, it certainly loses heat more quickly than the internal part; and if the volume of the internal part stays constant, the skin or surface cannot possibly shrivel up like a withered apple. Moreover, a recent theory holds that, so

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far from cooling, the earth is growing warmer through the radio-active action of the rocks. And this idea of a warming process, general or localized, also encourages the development of a tectonic theory.

Another hypothesis which has had enormous success and roused furious controversy is that of the drift of the continents. Although it was formulated as early as 1857 by Snider-Pellegrini, it did not become widely known until it was taken up and developed in 1915 by the geophysicist Alfred Wegner. According to this theory (which was further elaborated by Emil Argand in 1922), a primordial continent, a "Pangee", floating on a substratum of molten rock, would have been broken and its fragments have started to drift—the Americas to the west, India and Australia to the east, the Antarctic finally to the south. In their drift these masses would have compressed the thick layers of loose sediment that erosion accumulates in the marine hollows around the continent, and the compression would have become so intense that these strata (originally horizontal, but now folded and refolded on themselves) would finally have been thrust in an upward direction out of the sea, sometimes to a height of nearly five miles as in the centre of the Himalayan Chain. In other regions of the globe, on the other hand, the stretching caused by these drifts would make the solid skin burst open as it reached its limits of elasticity. Thus in certain zones colossal cordilleras have arisen, while in others the surface has fallen in, to depths of several thousand yards. Such, according to the theory of "mobile" continents, is the origin of this immense furrow where oceans could be swallowed and through which the *Calypto* was now making her way.

The cause of these irregularities could very well lie in the movements of convection stirring up the thick layer of matter in fusion which supports the crust of the earth. Although certain experts regard this internal matter as relatively solid it is generally admitted to be viscous and—subjected to the incalculable pressures that prevail at very great depths—capable of flowing. The differences of temperature which always exist between different levels, or even different regions of the same level, would determine the birth of currents, and these currents would exert such fantastic energy that they would have no difficulty in pushing out, drawing in, folding or fracturing the

thin superficial crust. For really our earth's surface *is* very thin; around thirty-five miles—less than a hundredth part of the earth's radius. On a small-scale model of the globe using a yard for radius, the thickness of the crust would be about a quarter of an inch, and Everest itself would appear no thicker than a piece of cardboard. On this same model the viscous cloak over the mysterious "core" would measure eighteen inches.

However this may be, it is on a thin sheet of cardboard that we live, and what goes on there should interest us in the highest degree. And so, when my companions on the *Calypso* were eagerly looking forward to the researches that they were going to carry out on the nature of the Red Sea water, its fauna and its flora, I thought with enthusiasm of the giant fissures, those major accidents in the history of the earth's surface; wherever they provided an outlet for volcanic lavas, specimens of submerged magma might arise; and I told myself that, perhaps, in the course of the next two months, it was going to be possible to catch a glimpse of some new aspect of the tremendous phenomenon.

We soon cleared the Strait of Jubal. From now on the Red Sea lay before us; but first we steered west to a point on the coast named Gardaqa, where Egypt possessed an oceanographic station.

This coast, whose swarms of reefs make it so difficult for shipping, gave our captain the chance of showing for the first time his real virtuosity at the wheel. For the coral reefs he had to steer among lay in irregular clumps with only narrow and tortuous channels—sometimes ending in cul-de-sacs—between them.

Usually these reefs do not break the surface of the water, but lie at some feet below. In rough weather the waves which break into white foam over the rocky shoals give warning to navigators; but in times of calm, only the difference in the colour of the water betrays the trap. The closest attention is needed; and if you have to steer in the face of the sun—a thing which should always be avoided—it is sometimes extremely difficult to distinguish the tell-tale shades in the blinding glitter of the tropical sea. That is why it is useful to be able to set the lookout as high as possible, not only so that he can see far, but—

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still more important—so that he can have the most direct view of the changing colours. The crow's-nest of the *Calypso* is unfortunately not very high, only about forty feet above the water line; and as it is about the same distance from the prow the look-out can never hope to examine the water in front of the ship at an angle of more than forty degrees. Still, whenever the passage seemed more hazardous than usual, several of us would be found up there, closely surveying the perilous stretch before us.

On this particular morning I was alone on the look-out platform. As I watched I noticed just below the horizon, in front and very slightly to port, a green streak cutting into the deep blue of the water.

"Reef ahead, about three thousand!"

Take note of that! In the two weeks since we had become sailors we had learnt the language. No more of the kind of exchange we had at Toulon when, for instance, Saout had thrown me the end of a rope, and while I tried to catch it with as unconcerned an air as possible, had called out: "Monsieur Tazieff," (sailors though we had become, we were still called Monsieur), "sling the dinghy for hoisting and make ready to haul"

There were moments when we were not proud of our vocabulary. But now port, starboard, dead ahead and the rest had for us no more secrets.

Warned by my call Cousteau scaled the ladder and joined me in the crow's-nest. In a quarter of an hour we came level with the reef, and skirted it, keeping to the left. It was no longer a simple green streak but a marvellous emerald block edged with opal, jade and aquamarine—a vast jewelled field with colours of a perfect purity in which the brilliance of rare gems mingled with more delicate shades in an astonishing cycle of cerulean blues and greens.

The steering soon took all our attention. The reef broke off as if cut with an axe, and a passage of deep water separated its edge from that of the next: perhaps the only navigable passage within half a mile of the coast.

"Hard aport!" cried the captain.

Ever since we passed the Strait of Jubal and had stopped taking a straight course, the automatic gyropilot had been disconnected and we steered by the wheel. As the helmsman in his

box-like position found it difficult to hear the orders sent down from the top of the crow's-nest, Jacques Dupas had stationed himself on the wing of the bridge to relay each order as it came, then to inform the officer that the manœuvre was in hand. Now he cried:

"Hard aport it is."

Soon a new order came from the crow's-nest:

"Hard astarboard!"

The channel ran straight for a cable's length, then began to take a winding course, and the orders to the wheelroom followed in more and more rapid succession. A sudden narrowing forced us to try a passage on the left; this led us into a labyrinth among a string of scattered little reefs. It was all the more dangerous since we had turned nearly 180 degrees and were proceeding in the face of the sun, still low on the horizon. Saout had joined us up there, and with all our attention, our screwed-up eyes half-blinded by the glare, we peered into the dazzling silver surface of the sea.

The engines were turning only at half speed; the navigable channels were getting narrower and narrower.

"Stop the port engine. Wheel hard aport!"

Up came the reply:

"Port engine stopped. Wheel hard aport."

The *Calypso* turned round slowly, engaged in her private battle.

"Stop starboard. Slow ahead port, wheel hard astarboard!"

Some seconds later, like an echo, followed the announcement that the orders had been carried out. Hardly moving, pushed along only by the single screw, the *Calypso* veered to the right and entered a passage hardly wider than herself.

"Slow ahead starboard, port half astern, wheel thirty port!"

Dupas had no time to make his reply before a new order came down:

"Half ahead both: steady your helm!"

"Both engines half ahead: wheel steady!"

"Slow ahead both: wheel hard astarboard!"

Slowly, inch by inch, we drew near to land. Behind the marvellous green of the final reef we could see already the bright yellow strip of a narrow beach, a few grey cement buildings, a short jetty, hangars.

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On the shore a group of about twenty figures gathered together stood watching us. It must have been the first time that a vessel of such a tonnage had come through the labyrinth. Using binoculars we could see not only fellahs but men in European clothes—trousers faultlessly creased, white shirts, horn-rimmed glasses—perhaps the scientists of the station. Some of them were taking photographs; one even had a superb Contax which gleamed in the sun.

"Can't be much fun living there," said someone.

"Yes, it's a dreary-looking place. Those boys ought to be pleased to see some visitors."

If they *were* pleased, they showed no sign of it. Hardly had we dropped anchor in a space so cramped that neither wind nor tide could have turned the ship, than—after taking a final batch of photographs—all vanished as if by enchantment.

"They've gone to make themselves look pretty!"

The dinghy was lowered into the water; Dupas, Nivellean and Ertaud stepped into it. Dupas, a one-time Camel Corps officer, was the only one of us to know Arabic. Ertaud was our photographer, and as for Nivellean, our doctor, his perfect manners made him the expedition's diplomat.

When the boat drew up at the tiny quay, only a few ragged fellahs were still to be found there. All the others had disappeared with the "intellectuals".

Our three emissaries moored the boat, and set foot on the lower part of the stone staircase which led to the quay; they were not even at the top, however, before the menacing apparition of soldiers with guns at the ready brought them to a halt. Four soldiers, a sergeant armed with an automatic rifle and a superior officer of forbidding appearance had risen from behind the cement barracks.

Looking down from the rail we followed what was happening, astonished and a little apprehensive. Dupas seemed to be arguing. The officer appeared to reply in the briefest of terms. This went on for five minutes, at the end of which the interview seemed to be over. Dupas and Ertaud sat down on a step, Nivellean leaned with his back to the wall. But the guns were still trained on them.

Then a man came down and unfastened a dinghy. The officer and two soldiers took their places in it and rowed towards us.

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Some minutes later they climbed the gangway, where our captain received them.

"It's just as well to have that fellow on board. Then, if they start to do anything to our chaps . . ."

The tone in which Dumas finished his sentence was enough to make his meaning perfectly clear.

The two soldiers stationed at the gangway looked inoffensive enough. Indeed, they hardly seemed capable of handling their Mausers. The officer, who had followed Cousteau into his cabin, appeared very sure of himself, however; and a tough customer into the bargain. Jacques Cousteau doubtless succeeded in persuading this Cerberus that we had nothing to do with perfidious Albion. Presently the visitor reappeared, looking a good deal less severe.

"May I have a look?" he asked in English.

"Certainly! With pleasure!"

It was quaint that the language of the hated British was the only one through which he could communicate with the French. But his tour of inspection must have been completely reassuring, for he held out his hand to the captain as he left the vessel and even managed a smile.

"I'll call Cairo by phone and ask if you can come ashore."

For another quarter of an hour, the exact time of making contact with the superior authorities in Cairo, our three companions waited patiently on the steps under the little round black menacing eyes of the guns.

"I would have felt better," Ertaud told us later, "if they had looked a little less half-witted; as it was, they hardly knew which end to hold their rifles."

And then suddenly the arms disappeared, the faces broke into smiles—they were inviting us to land.

"You realize," they explained, "that this is a military zone, strictly forbidden even to Egyptian vessels. And we are in a state of war, remember."

We had the impression that there was yet another reason when, on setting out again, we passed a little to the south an oilfield bristling with derricks.

As for the oceanographic station, that was a disappointment. It seemed more like a marine museum or taxidermist's laboratory than a centre of research. But the specimens were perfectly

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prepared and interesting in themselves: barracudas with mouths full of terrible teeth, giant rays, sharks, turtles, dolphins, and the strange dugong that one hardly ever meets save in a few out-of-the-way parts of the world, notably in the Red Sea; a creature whose breasts are so much like those of a woman that these whiskered monsters used to be taken for mermaids. In a tank a few live sharks were swimming, impressive in their supple strength. Very fine work of its kind, but that, alas, was all. As we strolled back, Cherbonnier summed it up.

"These Egyptians are always at their best—with mummies."

Chapter Four

AMONG THE CORAL REEFS

WE TACKLED ONCE again through the coral clumps, made our way round a low-lying desert island, and steered for the Rock of Daedalus, whose lighthouse illuminates the centre of the Red Sea.

The sun sank behind the violet turrets of the mountains. A band of sky, cut into saw-shape by these weird serrations, changed from brilliant orange to purple. A cloud stood out in iron grey, edged with a fringe of molten gold, and enormous streaks of alternate shadow and light were thrust across the vast indigo space. Then from the long line of horizon rose a kind of mist which passed imperceptibly from mauve to violet; then it was night. The stars glittered as if in a frosty sky, but there was no frost; only a mild wind was blowing, while the ship rolled from side to side in the dark sea.

Towards nine o'clock the next day we sighted the coast of Arabia. A far-off chain of mountains blurred with a light vapour ran parallel to the shore, a graceful undulation on the pale azure horizon.

An hour later, we were less than two miles off a low-lying barren beach. We veered a little towards the north in order to get back to the coral reefs and to collect (by dynamite fishing) our first samples of fish for the zoologists. We cruised along a cable-length from the shore. Sand; drab-looking stones. Some tufts of ash-coloured grass. A few grazing camels. Farther on, three crouching Bedouins, impassive, or is it indifferent? Perhaps they do give us a sideways glance, but without either turning or raising their heads.

Look-out duty in the crow's-nest.

The reefs through which we have to make our way are treacherously small. They do not reveal themselves; that is to

say, they remain under the water; but whereas certain of them cause breakers and can easily be recognized for what they are, others betray their presence only by a change in the colour of the sea. The lead is of little use in tracking reefs which plunge down vertically, for at the moment when it gives the danger signal it will already be too late. But with the sun to the side, as we have it now, it is fairly easy to locate the shoals.

"Ahoy there! Breakers at three thousand, ten degrees on the port bow!"

A further part of our nautical education: the learning of the units of measure. The fathom, six feet: the distance between the finger-tips of a fair-sized man holding his arms wide apart; the cable length, 100 fathoms or 200 yards; the sea mile, which is equivalent to one minute of latitude, that is to say, 2,000 yards.

The ship advances at low speed against a strong north-east breeze which sweeps in your face and flaps your trouser legs. On your back you feel the stinging burn of the sun.

"Ahoy there! Breakers dead ahead! A little beyond the others!"

The first reef appears already under the guise of a short green streak in the dark violet waves. Slowly, we approach. The green line becomes an ellipse, a little emerald field ringed with the dazzling white of waves as they unfurl on its shore.

A pass of a mile and a quarter separates the two reefs. The engines slow down. Should we anchor here? In front of us, not far away, a little fishing smack advances painfully, face to the wind, under its great triangular sail. It will be hours before it is out of sight, and we can't with any decency do our dynamite fishing until then. Through binoculars we can see the men clearly: three Arabs wrapped in white and heavily turbaned, crouched at the edge of their narrow boat which plunges into the hollow of the swell, ships quantities of spray, then rolls and rises on end only to dive head downwards again into the following wave. They watch us out of the corners of their deep-set eyes. What are they coming to do here, these foreigners?

Regaining speed, we make our way between two reefs and sail north in the direction of a white streak of new breakers, just below the horizon. We reach it in a quarter of an hour, and skirt it slowly. From the top of the crow's-nest we look directly

down on the little green circle ringed, as the waves sweep in, by frills of foam. Just below the surface the dark weeds wave in the swell.

We are terribly near the breakers. I would very much like the ship to stop, but Cousteau goes on. Standing on the top of the bridge, bending over the vertical hearing tube which leads to the man at the wheel, he calmly directs operations.

"Ten degrees to port."

The boat moves a little to the right. We advance towards the reef, but very gently. Through the transparent water we can see perfectly clearly the bright rock, bristling with protuberances. Will we be able to pull up in time?

"Stop the port engine."

The *Calypso* swivels round where she lies.

"Stop!"

For five minutes the bo'sun has been waiting at the windlass. Cousteau straightens himself and gives the order: "Let go the anchor!"

With both hands, Beltran frees the brake. The chain rumbles through the hawse-hole, dragged along faster and faster by the anchor's heavy plunge.

We see in the crystalline water the tufted tree-like growths of the coral; the delicate tangle, lilac or white, of the living polyparies. For the corals, or polyparies, are really animals. They belong to the same branch of the *Coelenterata* as the medusae or jelly-fish. Like jelly-fish, they are gelatinous, soft and translucent. But, unlike them, they possess a hard skeleton made of lime. They differ in other ways as well: they live for the most part fixed, not free; not alone, but in powerful colonies made of thousands of individuals joined together. They demand a temperature of not less than 18° and not more than 34° Centigrade, water of a high degree of purity, and a salinity of from 27 per cent to 40 per cent. Because of this, reef-building¹ polyparies are found only in the zone between Cancer and Capricorn, and always far from the mouths of rivers.

Although certain kinds can live at a depth of 300 feet, they grow vigorously only above the 150-foot level and better still at about 75 feet. They need water that is free from mud and

¹ The red coral used for ornaments is not a reef-builder. It is found, moreover, only in a few places—the Mediterranean, the Black Sea, the Yellow Sea.

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slime; it must also be well aerated and constantly renewed to supply them with the animalcules of floating plankton on which they feed. Since the aeration and the renewing depend on tides and currents, the growth of corals is normally most active on the outer edge of a reef.

These reefs are formed by the accumulation over immense periods of time of the chalky skeletons of millions of polyparies; to these are added the shells of molluscs, held together by the lime-crusts of weeds.

These constructions can reach colossal dimensions: on the one hand, in depth (the sounding of the Funafuti atoll in the Pacific failed to touch the rocky base though it travelled past more than a thousand feet of fossilized coral); on the other, in area—some of them being nearly a hundred sea miles in diameter. Here we must distinguish between the different kinds of reef. The fringing reefs are coralline constructions which grow up along the shores of a continent or an island. When a stretch of water sufficiently wide and sufficiently deep separates a reef from the parallel coast, it takes the name of barrier reef. The most celebrated example is the Great Barrier Reef some distance from the north-east coast of Australia.

Finally, there are the atolls, circular structures whose diameter varies from some tens of fathoms to two hundred kilometres. These are found almost exclusively in the Pacific, the Red Sea containing no more than two or three of them. Their composition is curious: inside the ring of madrepores low on the water grow coco-nut palms ruffled by the trade winds; within that, a lagoon, usually about twenty-five fathoms deep and never more than fifty. This lagoon has a horizontal base of coral sediment, bristling with myriads of coral pinnacles. Outside the rim, however, the shore is vertiginously steep, sometimes plunging downwards as far as the abyssal depths. Atolls are probably volcanic in origin. The circular form suggests this: so does the abundance of volcanoes in the Pacific, particularly as there are no rocky islands of any other nature in this ocean. But since polyparies cannot develop below fifty fathoms or so, and since all the atolls go much deeper than this without the coral—dead though it is at this stage—being replaced by rock, it must be assumed that the growth of the reef began at a time when the volcano was emerging and thereafter

followed its course, increasing in height as the bedrock sank deeper under the water. Two theories are in conflict here: either these are volcanic islands which are sinking down in the heart of the ocean in a slow subsidence, or else it is the level of the sea which is slowly rising. This second theory really seems the more plausible.

In the Indian Ocean, and in the Red Sea which is only a dependency of it, you can find, as well as the fringing reefs, a number of circular reefs of small horizontal dimensions—really, the peaks of submarine mountains with extremely steep sides plunging to great depths. Here also the growth of the corals has checked the rising of the water; but instead of growing from a volcanic base, the polyparies have probably built on isolated hillocks above what was at that time a plain in a fair-way to be swamped by the sea.

Two men have hauled up the dinghy on to the gunwale and with a vigorous push sent it into the water. Cousteau and his inseparable diving companion Didi Dumas climb into it, and the little boat is rowed towards the reef. This is the first reconnaissance; the first time we touch the real object of the expedition, the underwater study of coral reefs.

A glass mask on his face, a breathing tube in his mouth, Cousteau slips into the water and, with the dinghy at his heels, he immerses his face and slowly swims all the way round the green patch. Then the two men return to the ship, climbing over the side. Once on the bridge Cousteau snorts away the water and his enthusiasm bursts out:

"Indescribable! *Indescribable!* Sensational! Nothing in the Mediterranean or even the Gulf of Guinea can compare with it!"

Jackie Ertaud, coming out of his dark-room, appears at that moment.

"Ah, Jacques, have you had a good time? Was it wonderful? Don't tell me it was *indescribable!*"

He knows his old friend Cousteau.

"But indeed it was! Absolutely in-des-crib-ab-le!"

The good humour is general. "What, again?"

"Everything! Colours you couldn't possibly imagine, colours of every kind. . . . The most extraordinary coral flowers

—think of it: a large plate six feet across, less than half an inch thick, placed horizontally on a central stalk, and there, beneath it, sheltering from the sun, a swarm of astonishing fish. Indescribable!”

The dinghy pushes off again. Dupas, his powerful, hairy torso burnt as a Berber's, is at the oars; Cherbonnier, very dignified, is in the stern, armed with the landing nets, while, in the bows, Didi Dumas prepares his grenade of T.N.T. It is exactly by the steep shelf, the part where the reef plunges abruptly down to its base, that Cousteau has noticed the greatest concentration of marine life. Leaning overboard, Dumas peers into the crystalline water. They go a little farther, and suddenly he throws the bomb. Now the detonation—a deafening dull shock that even we on board feel through the hull of the ship. A spout of water rises . . . the shaken dinghy dances on the concentric waves made by the explosion. Some moments of waiting follow, and then the fish appear at the surface, belly upwards. And all of us, from the *Calypso's* bridge, howl our directions to the boat as it comes, goes, and twists like a figure eight.

“There! There! Behind! No, more to the left—no, more! Oh, there's a monster!”

This kind of fishing which leaves no chance to the fish can hardly be called sporting, but the end may be said to justify the means. That end is the study of the little-known fauna of this very peculiar sea, deep and almost wholly enclosed, since its only communication with the Indian Ocean is by the narrow strait of Bab-el-Mandeb, which merely lets the surface water through. It is a sea of unusually limpid waters, for, from the deserts which border it on either side, no river comes to pollute it with mud. It is also a sea of unusually warm temperature, for its whole expanse lies in the warmest region of the world.

And now the dinghy has returned, and on the *Calypso's* quarter-deck is thrown an unbelievable harvest. Some of the fish are familiar in form and colour—grey, bluish, silvery. But most of them are strange and weird, globular or flat, ribbon or disc-like, with extraordinary profiles and whimsical expressions; some are all one colour, some are streaked with many—carmine, electric blue, deep orange, warm ochre and lemon yellow, velvet black, malachite, vermilion, dark violet; some

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of them are uniformly speckled, others are spotted haphazard; most of them are streaked or striped. One little green fish, striped with black, blue and red bands, has a tail half orange, half yellow.

At the sight, Dumas has lost his usually impassive air; even Jean de Wouters, our imperturbable engineer, has shed a reserve that was becoming proverbial on board. All the crew crowds to the deck; there is no mistaking their excitement. The only ones apparently untouched by the aesthetic side of the spoil are our two industrious biologists, Cherbonnier and Mercier-Levy. They have already begun their work of sorting out the specimens which they proceed to arrange methodically, photograph, and put away in glass jars or great milk cans filled with alcohol.

Chapter Five

ABU-LAT

JIDDA—WHERE WE arrived towards evening without having hired the aid of a pilot, after "slaloming", Cousteau-fashion, between the formidable parallel reefs—Jidda didn't receive us very warmly. There were arguments at the customs, endless palavers in which Dupas patiently turned out all his knowledge of Arabic, finally a refusal to permit landing without a medical examination on the following morning. All these petty bullyings for having disdained the services of a pilot.

Jidda is the port of Mecca, holy town of Islam. It is a commercial city, both consular and diplomatic, the only one in all the kingdom of Arabia where non-Moslems may on occasion be allowed to live. The capital, Riyadh, is situated at some distance away, well into the interior of the desert, in the heart of Nejd. There lives the old warrior who holds together under his fist the turbulent tribes of the nomad Bedouins—Ibn Saud abd El Aziz.¹ And Jidda is the narrow gateway to his empire of sand and rock.

Ships anchor a couple of miles from Jidda in a road encircled by fringed reefs. Seen from the port, the white town lying along the low coast, with its minarets and its old tall houses, does not disappoint the traveller's dreams; this must indeed be the gateway to the Orient of legend.

Alas! We were able to land, we were allowed to approach the fabled city, and the Thousand and One Nights vanished, chased away by the modern blocks of flats, the frightful cement structures, the great American automobiles, and also by the omnipresent obsession with advertising: in spite of the Arab lettering, the inevitable Coca-Cola hoardings were only too easy to recognize. In the heart of this mushroom modernism

¹ Ibn Saud, who died in 1953, has been succeeded by the oldest of his seventy sons.

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commercial and ugly, the antique dwellings with their overhanging and latticed *moncharabihs* and their heavy nail-studded doors seem resigned witnesses of a world which once knew grandeur.

Arabia, holy land of Islam, has always been closed to infidels. A little commerce with them is carried on by the coastal cities Yanbu, Jidda, Qunfidha. The interior is an immense stretch of desert baked dry by the sun. There are a few oases, some springs; tufts of coarse grass; thorny plants on which the camels feed. And tribes, nomad and wild, wander endlessly about the endless space.

After the first world war, oil was discovered on the border of the Persian Gulf. To-day these oilfields, worked by the American company Aramco, bring in royalties of five hundred million dollars a year. That accounts for the cars, the refrigerators and the radio sets of the sheikhs of Jidda, and all the attendant ugliness of the commercial outposts of the West. But old Ibn Saud himself rigidly refused to compromise; and the western ugliness has hardly polluted anywhere but Jidda, a kind of necessary abscess drawing off the humours of the rest. As soon as you leave, as soon as you put behind you the asphalt roads and dusty alleys, the last vulgar hoarding and the last petrol pump, you are straightway in the purity of the desert.

We made a brief excursion there with the French consul, Bernard Laussac, a broad-shouldered fellow, sympathetic and enthusiastic about the place—eager to see and to learn. He took us in his Land-Rover on the Medina road, across the low plain which borders the sea. But soon, turning eastwards, we abandoned it to follow the bed of a watercourse, and this was the beginning of ninety miles in the splendour of the red granite hills thrusting up from the infinite gold of the sands; the vertiginous cliffs of black basalt that we coasted for leagues and leagues; the caravans that we passed, leisured and tranquil as if time had no meaning; impassive trains of loose-limbed, patient dromedaries. And sometimes we would find an oasis, like a fresh green miracle.

We went up to the very limit of the boundary which fiercely forbids the approach of infidels to Mecca. On the new macadamized road which has lately linked Jidda to the Holy City, great hoardings carry in Arabic and English the terms of the

prohibition. Apart from the road, however, there is nothing to indicate that the traveller is too near the forbidden walls. But Laussac knew that this would not count as an excuse in fanatic eyes, and we veered towards the south, then to the west, before penetrating into the dangerous zone.

For this excursion, an official authorization had been necessary. The Minister of Foreign Affairs, the Emir Feisal, son of the king, had granted this to Cousteau. Cousteau also requested permission for me to penetrate the hundred and twenty miles or so into the interior, but farther towards the south, at the height of the twentieth parallel. I wanted to reach the chain of low mountains which runs parallel with the sea, and which are probably a form of rift caused by a fault in the earth's surface.

Cousteau had easily obtained permission, and I was delighted at the prospect of a fortnight's exploring in those unknown regions. So readily in fact had these two authorizations been granted that I began to believe that the millions of dollars flowing into this country in exchange for its oil and its strategic position had weakened its religious prejudices. I was later to find out my mistake.

At eight o'clock in the morning, in a lively north-west breeze, it was agreeably cool on the violet sea. We scudded along south in the direction of the immense Farsan coral bank, which covers an area more than three hundred miles long and over sixty wide, from the approaches of Bab-el-Mandeb to those of Jidda.

The chart shows an infinity of reefs in that area, a scattering of atolls and sandbanks—some conspicuous, others not—all grouped in clusters more or less thickly, and separated by channels often surprisingly deep: a hundred, two hundred fathoms or even more. In parts of the map a vast white patch spreads out in the middle of the grey whirl of minute figures and circles, and on such patches are the magic words *Highly Dangerous*, or *Dangerous reefs: deep water between without navigable channel*. Or, again, *Uncharted area*.

We were navigating at the moment in the middle of one of these white spaces, and it seemed almost strange to see about us nothing but the intense blue of the sea.

"Reef ahead!"

From the bridge we had not yet perceived the green streak signalled by the look-out, but it showed itself soon enough, and we skirted it at reduced speed, for Cousteau wished to continue the business of the day before yesterday—reconnaissance and dynamiting. Once again in the search for an anchoring we were to graze the edge—a frightening contact. Leaning over the rail we could distinguish, as if within hand's reach, the branching or globulous heads of the coralline colonies, several feet down in this crystal water.

This time the *Calypso* sent out four swimmers, with the motor-boat as escort. From the crow's-nest the view was comical: four men lying face down, stretched out side by side, great soles of blue rubber on their feet, rumps just awash; each man, under his little vertical breathing tube, gazing earnestly down below as if looking into a well.

"Ahoy! A-ho-y-y! Shark!"

De Wouters had just spotted it from the bridge. Now it circled round the *Calypso*, a lithe and powerful creature. We added our cries to those of Wouters', but the swimmers did not seem to hear. The shark continued to swim round the ship, at the same uncomfortable distance; we feared, too, that it might not be alone. We were going to lower the dinghy and rush to warn our companions when we saw them make a sudden half-turn and swim at full speed towards the boat. They reached it in a few seconds, and we breathed a sigh of relief to see them catch the gunwale and swing themselves over into safety.

It was, in fact, a second shark which had put them to flight, by charging towards them—towards Cousteau, more precisely: "That," Cousteau remarked, "shows the creature's inexperience; he would have found nothing on me but skin and bone."

The shark, when a few feet away from the swimmers, had turned round in full career and was speeding into the distance. This confirmed our view that these carnivores do not attack without first having described a series of circles round their prey. But our hearts hadn't beat any the less violently for that! We had renewed our course for the south barely five minutes, and were advancing slowly, when a deafening heavy shock jarred the vessel. Everything stopped. We were aground.

Leaning over the rail we saw, eight feet below the surface, the reef on which we were caught. I raised my eyes: all round

us there was only the blue horizontal immensity, a desert of water. The solitude was all too perfect.

Again we lowered the motor-boat into the sea, made a tow-rope of a hawser, and set the frail power of the outboard engine to the job of hauling off the ship. Luckily we were to the leeward of the reef and, helped by the swell, a strong breeze gave us the push we wanted. Because of the gentle speed we had been making we were not very much out of control, and before long we felt that we were once more afloat. It was an extraordinarily agreeable sensation. Calmly, Saout noted in his log-book: "10h.34. Slightly grazed a reef." Still going cautiously, with double look-out, we steered for Abu-Lat.

Abu-Lat is an islet of the Farsan group which the Seaman-ship Manual (as well as a German geological map) marks as volcanic. It should thus provide the most northerly volcano of the Red Sea, the least distant from Jidda, that is, from our point of view, the least distant from the chance of stocking up with fresh water and provisions. To my colleagues on board it mattered little whether the island was volcanic or not, since they were concerned only with sea water and sea-water biology. It was for my sake that Cousteau, who unfortunately hadn't enough time to go as far as the southern volcanoes, had chosen this one, the least remote, so that at any rate I could have my ration of lava. Even extinct, a volcano is still full of interest, if only for the finding out of the period at which its activities ceased. The relation between this ceasing of activity and other tectonic phenomena can indicate the way in which a volcano works, why it develops, and why it dies. In this science, which is not yet a century old, so much remains unknown that all original observation, however small, is of value in the task of solving its tremendous riddle.

A little truncated cone appeared, like a grain of rice on the horizon: Abu-Lat. Gradually, on both sides of the cone, low-lying coasts became perceptible. Soon the entire island was in sight. It was impossible to judge how large it was, for there was nothing to serve as a scale of comparison; not a palm tree, not the least human construction.

It was two truncated cones, not one alone, that rose over the low shore, which stretched out almost at the level of the water. As we drew towards it, the emerald surround of a fringing reef

came increasingly clearly into view. Great birds which were rather like wild ducks came flying over us, showing a large white inner wing-span and a black underside to their bodies. They hovered above the *Calypso*, turning their heads with curiosity in all directions, and stared at us with great interest.

"Those are boobies," said Cherbonnier.

"Boobies?"

"No, not that kind. Boobies is their name."

We were now very near the island, and the colour of the cones was troubling me: it was exactly the same as that of the rock below, which was plainly of coralline origin. But I did not wish to give up hope, and I anxiously scanned the rocks through binoculars, seeking some sign, however slight, of volcanic character.

For a while we coasted the reef, which wreathed the isle with a band of magnificent green, three or four hundred yards wide; then Cousteau steered us into less deep waters after weaving his way through a pass among foaming white breakers. For nearly an hour he played at his favourite new game: navigating in a labyrinth where no one else would have dreamt of risking a ship. And I asked myself—not if it was possible to advance in that way, since each move was made with such assurance—but how we would ever get out of it, most of the channels being apparently navigable in one direction and not at all in the other. Finally, at two hundred yards from the shore the anchor was dropped at a depth of eleven fathoms.

The larger of the two cones was now just in front of us. I could no longer deceive myself: the whole lot was coral, old fossilized coral that the changes in the level of the sea had brought to the surface. It was only by a curious chance that these two particular structures had taken the form of cones, and so had deceived the cartographers and the editors of the Seamanship Manual.

These editors had also informed us that the island, which was two or three miles long and half a mile wide, was barren and probably waterless. So it looked as if we would have to bring along all the drinking water needed by the landing team during their stay. But, in spite of the impatience which seized the biologists at last in sight of their goal, it was necessary to find

another anchorage before they could leave the ship. There could be no question of the *Calyпсо* amusing herself by winding her way among the coral heads, as she had just been doing, each time she came to bring fresh supplies to the base; in any case we were not yet out of the labyrinth. Besides, during the naturalists' sojourn on land, the ship's crew would have other work to do—exploring the north part of the Farsan bank; making deep dives to examine the shelves of various reefs; transporting the geological equipment to the mainland two weeks later. And at the end of each journey the vessel had to anchor in a place safe, sheltered, and not too cramped for movement.

We decided, therefore, to sail round the island and investigate likely positions. Unfortunately, the wind had risen to such a point during our halt that it was no longer possible to turn among the corals without extreme danger. It was not, alas, the first day we had lost; but it had its compensations which we all appreciated—a night of rest, at anchor, with no watches to be kept. The next day the wind had dropped. In half an hour, by an astonishing feat of navigation involving more than fifty changes in course and engine speed, the captain led us unscathed out of the lagoon.

But our search was vain. There is no good anchorage around Abu-Lat, and we had to decide on a place outside the reefs and under their lee; hardly sheltered, but with good depth for anchoring. This anchorage turned out to be quite satisfactory during the prevailing north-westerly winds, but there were whole days when the *charkel* blew violently from the south-east. Then the *Calyпсо* had to raise anchor. As there was no suitable anchorage on the other side of the island the ship was obliged to cruise about in a choppy sea sometimes for as much as twenty-four hours.

In a strong north-west wind, well fixed on two anchors, she ran little chance of being driven on the reefs, but she did have to endure the short swell of the Red Sea. From the firm ground of the camp installed on the island, we could see her rolling from side to side, sometimes at an angle of sixty degrees. At these times we did not envy our companions still on board. We had only to remember the rough passages we had had ourselves to imagine their discomfort and the oaths which were

surely seasoning their meals. For Hanen, the ship's cook, a pale-faced man with hair so fair that it seemed to be white, was an extraordinary character: indifferent to storm or sickness he produced his meals without fail; and one of his greatest pleasures was to prepare a very liquid soup whenever the rolling of the ship was particularly pronounced. This dish he reserved for the most violent squalls. He would peer through the kitchen hatch with malicious light-lashed eyes, and loudly demonstrate his joy at the spectacle of the unhappy crew battling with the scalding liquid as it slopped over the plates to fall in a shower on their knees. Even if the receptacles were kept still with the help of the little wooden pegs that in bad weather were stuck into parallel lines of holes in the table, nothing could be done against the madness of the contents.

One stormy evening, at dinner time, I had waited for a moment of relative calm before opening the starboard door of the mess-room, for fear that one of those great waves known as *baleines*, or "whales", would come in with me. During the pause, however, I received the impact of one, then another, of these heavy billows. Soaked to the skin, I did not wait for the third but opened the door and placed my rubber-shod foot on the soup-flooded lino. At that very moment the ship tipped up to port, my foot slipped from under me, and I was thrown flat on my back, one foot still in the air, to the end of the room twenty feet away. As the others thundered with laughter I shot like a torpedo into Beltran, who was at that moment lifting his plate to his mouth to swallow his soup without the feeble aid of the spoon. Brought down like a rugby player he collapsed on me with his plate still nearly full, and as the ship at that moment gave a list to the other side, off we went again, dragging with us Saout whom Beltran had tried to clutch hold of, also Saout's chair and Beltran's chair and the plates and the cutlery. . . . There was hardly time to bang our skulls against the pipes at the other end of the room before we were thrown back in the opposite direction without ever managing to find our balance on that vermicelli-littered skating-rink of a floor. When at last the *Calypso* had escaped from the shoal of "whales" she had un- luckily strayed into we were able to stagger upright covered with bruises, cuts and bumps; but suffering more perhaps from the helpless shrieks of laughter which seized us—caught, no

doubt, from the spectators safely installed on the fixed bench on the other side of the table.

That is why, from our island base, we felt sorry for our companions when we saw the boat dance on the swell at the end of her anchor chains, and congratulated ourselves on having for the time being returned to solid ground.

Having chosen the anchorage, we did not land, but continued up to the Arab coast, about twenty miles away. According to the chart there was a village there called Lith, and our captain was anxious to pay the emir of the place a courtesy visit: the island was part of his territory, and so was the mountainous part of the interior where we counted on making a long-distance geological expedition a little later.

We hove to in a creek several hundred yards from the low shore on which rose the ruins of a kind of fortress dating from the Turkish occupation; and our diplomatic corps took off in the barge—the captain, the doctor, and Lieutenant Dupas, interpreter. Lith could be seen in the distance, its most prominent feature a medieval castle set in the green patch of a palm-grove. Our companions set foot on the sandy beach which bordered the creek, and shortly after we saw an American car appear—quite a recent model; it stopped, picked them up and bore them away.

Some hours later they returned, delighted with the emir and his welcome. He had offered them hospitality with true oriental pomp, and had promised his unconditional aid in anything that we could want.

Back we went to Abu-Lat, where the landing began. Between the anchorage by the reef and the beach of a crescent-shaped bay, we made constant comings and goings on our aluminium flat-bottomed barge, an ideal craft for navigating coralline shallows because it drew so little water—only a few inches. In three or four hours we had put out on the shore the cases of glass jars, the casks of formalin and alcohol for the biologists, the packed-up tents, the camp beds, the provisions, the cooking materials, the tanks of fresh water (we had twenty-two gallons, which was not much), the radio transmitter and receiver, topographical instruments, tools, weapons and the rest.

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In a violent wind we pitched the tents about a dozen yards from the shore. They were in the shelter of a little wall curiously hollowed out into an overhang by the dissolving action of the water on the limestone rock.

Leaving us there the *Calypso* raised anchor and set out for Jidda.

Chapter Six

THE CRABS

WHILE MY COMPANIONS were setting up field laboratories in the open air or under canvas, I wandered into the interior of the island, this tiny desert lost in the heart of the sea. The skin of my face was burning. The sun was nearly at its zenith, and it seemed to breathe fire.

Alone, at last! In spite of the exceptional good feeling among us on board, I realized now after three months of communal life how much I had missed the sensation of liberty that the individual man can never really have away from land. A ship is a limited space, strictly circumscribed. Like a prisoner in a cell, you can walk only round and round or up and down. The longest stroll on the *Calypso* would be nine yards. Not much for a geologist.

It is good to walk alone, feeling that you *are* alone, and can be so for as long as you like. The ground underfoot was fairly uneven, made up of debris of coral or sea shells, for the whole island is nothing but an emerged reef. Some thousands of centuries ago these brittle remains were living organisms under a shallow sea. I wondered what change in the level of the water or what thrust of the sea-bed had brought the coral bank above the surface, transforming what was once a mountain of life into a rocky waste.

The surface of the island appeared now as a simple stony plain gently inclined from south to north in its length. It was varied only by some not very emphatic depressions, and was ringed by a cliff varying in height from six to ninety feet. There was no evidence of volcanic activity. No granite, no slate—none of those rocks beloved of geologists. Everything was coralline. It was a disappointment, but it couldn't be helped. I still had the work of filling in the map of the island and tracing back the clues to its history: successive emergings and submergings:

fractures resulting from upheavals which have affected the region of the Red Sea.

First, I had to build up a network of cairns to serve as triangulation points for surveying the surface with a theodolite. I found that I enjoyed shifting the base-stones, best part of a hundred-weight though they were.

In spite of being well tanned by the sun during these past weeks, I began to feel the stinging sensation of sunburn on my skin, forehead, back and legs—a sensation not unlike that of sipping boiling grog on a day of hard dry frost. The experience was not a new one. During my travels in the Congo I went about wearing only linen shorts and sandals, to the horror of certain whites of the region: "It won't do, old man; must keep up appearances . . . the natives, you know." The more liberal-minded objected on medical grounds: the danger of sunstroke, the increased risk of insect stings or snake bite. "At least wear a vest, at least wear something on your head!" In more than three years, I made only one convert: he found that my ways suited him well, and was astonished at the result after fifteen years in Africa! But even he did not dare to remove shirt and head covering except when a mission sent us into the forest alone, far from the imperious eye of his wife.

In twenty minutes I had crossed the island from east to west, skirting a little patch of xerophile plants—plants that thrive in dry conditions. We referred to it as the oasis, but it was a pompous name for the tiny saucer of green. I walked round the base of the thirty-yard-high cone which had earned for Abu-Lat its false reputation of being volcanic, and reached the shore. Here the plain gradually inclines to the level of the sea.

A narrow beach of white sand separated the bright gravel of the island from the green water of the lagoon; from the peaceful and shallow depths rose hundreds of heads of dark coral, like negroes immersed to the neck: they were the crests of dead coral blocks hollowed into tiny cups and caverns by the usual colonies of enveloping weeds. Over some of these "negroes' heads" the broad white patch of a mound of bird droppings stood out in contrast. Egrets, pink or white flamingoes, gulls, staying motionless for long hours on their tiny individual islands, were among the visitors to the lagoon.

I reached the extreme north end of Abu-Lat where three

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caples lost at the end of three narrow peninsulas seemed to strain towards the open sea, hardly connected by a thin umbilical cord. Sea birds lived there in swarms; solemn pelicans, white spoonbills with long black beaks flattened at the end, fish eagles, sea-mews and numbers of those boobies that we found so charming. They seem very trusting and show little fear of man. There was an occasion when one of them alighted on the ground two paces from Jackie Ertaud, its dark wingspan framing its immaculate white front. Ertaud looked at it gravely, and then remarked: "*Je croyais ma poitrine blanche, Monsieur, mais la vôtre a la blancheur Persil.*"

On the shining sands of a creek, at the edge of a lagoon whose marvellously luminous green was flecked with the violet of submerged reefs, lay the corpse of one of these birds, one black wing pointed to the sky. On the still-warm body crabs—swift-footed ocypods—were already busy, a tumbling mass of pink and yellow. I approached to photograph the scene. There was a wild stampede towards the lagoon. I squatted down near the bird and waited for the crabs to return. Ocypods are mainly land creatures. They dig themselves holes and tunnels in the sand which they throw back with quick thrusts of their claws; as it piles up round the opening it takes the form of little cones from five to ten centimetres high; they are astonishingly like the thatched roofs of a Lilliputian village. Like all crabs, these live on dead organic matter that they find either in the sea or on land. They are diligent scavengers, never leaving anything to decay.

My crabs had fled as far as the water; once in it they had stopped. They looked at me now with their attentive eyes, each at the extremity of a stalk: a forest of miniature periscopes peered above the surface. After some minutes the creatures emerged, little by little, and began to draw near once again. They did not return in a straight line—far from it. They moved sideways; they stopped; they began again in the other direction, first from left to right, then from right to left. When they ran, they seemed to be on the points of their toes, like ballerinas. Whenever they halted, they bent their eight knees and delicately laid their stomachs on the sand. It took ten minutes for the two most audacious, solid fellows as big as one's hand, to return to the immediate proximity of the bird. One was pink,

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the other bright yellow. They progressed in stages, pausing to look at me out of their elliptical eyes, watchful on the extended stalks. At last they reached the dead booby, climbed the little hillock of dark wing feathers and soft white down, and plunged their great claws into the open stomach. They must have been very happy.

But their colleagues behind them continued to hesitate. Spread out in extended formation, in twos or threes, the width of a crab between one and the next, they advanced only with the utmost caution. A few steps to the right—stop! A few steps to the left—stop! In unison they tottered onwards on their toes; in unison they planted their stomachs on the ground. When they were within a few paces of their goal they formed a fan with an arc of about twenty feet. The ballet continued; you would have thought the movement strictly lateral, but they undeniably came nearer: the fan was no more than twelve feet away, then nine, then six. . . . Now their legs touched the legs of the next; now they were pressed more and more closely together, and always edging towards the bird on which the two absorbed pioneers were working so feverishly away.

I found myself almost liking these ocypods, the kind of liking you always feel sooner or later for something you are studying. There was a time in my life when I had this sort of affection for the Colorado beetle; and I know a young woman at the museum who studies spiders and loves them quite tenderly. Meanwhile the fan shrank until it had crumpled up into a pink and yellow swarm, rather frightening somehow. They reached their objective; they swept over it, and nothing could be heard but the click of dozens of mandibles in action.

It was about two months later that I had the disagreeable experience of finding *myself* attacked by a swarm of crabs. I had been landed alone on a little island called Marmar, some dozens of miles to the south-west of Abu-Lat, and the *Calypso* was standing out to sea for twenty-four hours. As night fell, I pitched camp, setting up my bed in front of the tent.

The sun had hardly disappeared behind the horizon when I noted a number of waiting ocypods gathered together in an arc-shaped battalion about four yards away from me. At the time, I was busy preparing the fire. Carefully breaking the

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twigs I had picked from the pile of brush which covered the centre of the island, I was arranging them in a pyramid before placing heavier pieces of wood on the top. It seems that these movements kept the crabs at bay for, when my work was over and I stayed quite still to watch, my visitors began to approach. Not in a direct line, you may be sure. Crab-wise. Little steps to the left, little steps to the right, stop; a glance around, then the whole procedure again. The front was closing in; soon the first rank was no more than a yard away from me while behind other crabs pressed on in multitudes. In their fitful way they were advancing, their eyes standing out at the end of their stalks.

I made a sudden move which started a brief panic. Then the arc formed again twelve feet away from me and after a short hesitation, the soundless jointed ballet began again. A new movement did not put them to flight; there was only a cautious halt before the orderly advance was renewed. Abruptly I stood up. And I had not taken two steps before the band had scuttled into the peaceful water of the lagoon.

Night fell. Not five minutes had I been sitting down when the weird circle began to close on me again. In spite of the growing darkness I could still see the pale swarm that moved over the blanched sand. Once again my rising put the crabs to flight, but they stopped before reaching the shore, and the following time I had to walk straight *at* them to force them to scatter. They were visibly growing accustomed to man—but this undeniable proof of intelligence did not please me very much.

"This can't go on all night," I told myself. The idea of not sleeping after a tiring day was even more distasteful than that of having my feet nibbled. "You horrible creatures, do you never sleep? Perhaps the fire will protect me; it has kept off leopards before now."

Dried by weeks of unrelenting sun, the wood burnt brightly. The crabs retired a little. It was a fine crackling blaze, without smoke, fed with planks and driftwood that I had collected from the beach. After a day of flat calm a light east wind had risen. The dark blue sky glittered with stars. The crabs approached no further, held at a distance by the leaping flames. Then, as the nervous strain I was feeling suddenly slackened, I realized into

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what state of tension the siege had driven me. I knew very well that the creatures were not dangerous, that they fed only on non-living flesh. And yet . . .

I stretched out on the sheet of my camp bed. One side was the pile of fuel, on the other the fire. I fed it from time to time, and the host of pale visitants, not moving, observed me out of hundreds of staring eyes.

I don't like being kept on edge. A curious wave of anger began to rise inside me.

"Filthy mites! Why can't you leave me in peace?"

Getting to my feet, I threw a large lump of coral with all my might at the invaders. In a few seconds they had all fled to the water, leaving on the ground a couple of wounded which desperately waved their far too many legs. I then collected a supply of ammunition and went back to bed, watching out of the corner of my eye the two still kicking in the sand. Some moments later, their recent panic forgotten, the crabs returned to the scene. "Are they going to carry their wounded to shelter?" I asked myself. But I soon saw that for the crowd which surged about them the casualties were nothing but a providential meal. As soon as the wild clawing of the air ceased for a second, the nearest crabs tried to seize with tensely opened pincers a piece of one or other of their defenceless relatives. But still the unhappy pair continued the frenzied waving of their limbs which kept off the aggressors. Little by little the movements of the dying creatures became weaker, more intermittent. As long as any quiver of life still shook them, their hungry brothers dared not eat. But they had not been dead a moment before the corpses disappeared under a horrible mass of spindly limbs, enormous claws, pink backs and yellow backs that the flames lit with their dancing light.

When I woke again in the early dawn the only traces of the affair were thousands of prints of claws scribbled on the dry bright sand.

Chapter Seven

THE PLEASURES OF DIVING

ON THE ISLAND of Abu-Lat our existence was rapidly organized. Jacques Dupas was the officer in charge, and a more sympathetic chief could not be imagined. We were divided into shifts of two for the usual duties: cooking, washing up, cleaning the camp; but it was very rare for Dupas not to take an extra share in the work of his companions. Morale was excellent, and it was the usual thing for each man to try to do rather more than his own quota of chores. It was really exceptionally lucky that all these men, knowing nothing of each other before the start, the products of different and sometimes rival scientific institutions, should have made so congenial and coherent a team as soon as they were together. In expedition life it is essential for each man to do his own part of the common work without fuss and also a little of the others' work as well. Cherbonnier and Dupas, Calamme and Mercier-Lévy were, in this respect, ideal companions.

The *Calypso* returned to us from Jidda with a new group of "professors". They had come from France by air: Jacqueline Zang and Claude-Francis Boeuf, physio-chemists; Professor Pierre Drach, zoologist at the Sorbonne, and Professor André Guilcher of the University of Nancy, geographer. The study of the island advanced rapidly. At different hours of the day and night, Zang, Calamme and Francis Boeuf took samples of the sea water at various points in the lagoons. They would then analyse these specimens for salinity, acidity and density. The temperature of the water varied very little. A bathythermograph, an instrument to register temperature, had been dropped from the *Calypso* to a depth of 500 feet; from this we had learnt that to a depth of 350 feet the water remained almost constant, at about 80 degrees Fahrenheit. This magnificent warmth of the sea made diving very agreeable.

For we dived a great deal, whether to seek for specimens, to catch lobsters for dinner, or quite simply to cool a skin grilled by the sun. During the first few descents we had to do without the Cousteau diving apparatus: our new compressors were not working well, and we had to wait for the mechanics to put them in order. Meanwhile we went down with the simple gear of underwater hunters; rubber flippers on the feet, glass eyepiece on the upper part of the face, and a breathing tube between the teeth. Through the exceptionally crystalline water we could see as clearly as in the air.

On the upper and horizontal face of the submerged plateau-type reef there were broad sand-covered zones where life was relatively sparse: some starfish; some sea-slugs, those grotesque dark brown sausages (they are actually closely related both to the starfish and to sea-urchins); some rare grey or bluish fish; perhaps a few heads of coral. But once at the shelf where the reef plunges perpendicularly down towards the deepest levels, the marine half-desert gave place to a profusion of extraordinary life. Corals of all kinds had grown into a veritable forest; you would find copses of graceful stems, of fine interlaced branchings; clusters of massive spheres or kidney-shaped growths; boughs of violet, leaves like snow-white fingers, globes of clearest yellow; the colour of coral is always delicate as a pastel. And in this tangle, under the overhanging ledges and through the narrow gorges of the reef, swam a marvellous fauna of rainbow-coloured fish, showing every shape, every colour bright or pale, every combination of spots, stripes, rings and rays.

It was from here that our principal harvest of biological specimens was gathered. You would go along, face downwards, your flippered feet waving slowly, until perhaps an unusually interesting piece of coral would appear in your field of vision. A deep breath through the tube, and you would plunge below with a strong kicking thrust, fifteen, twenty or sometimes thirty feet down. A blow with the hammer or a push with the lever would generally serve to detach the specimen; a thrust with the heel would be enough to make you rise at one bound and bob up suddenly like a duck. You would wave an arm to the dinghy, which went from one swimmer to another collecting; and the spoil gradually mounted up. We did not venture

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beyond the cliff which formed the outside edge of the roof; there, the water changed suddenly from emerald green to indigo; there, disturbingly, roamed barracudas and sharks.

As soon as the compressors were in working order again the little breathing tube was replaced by an autonomous diving apparatus, and the deep dives began.

The autonomous diving apparatus, perfected by Cousteau and Gagnan, is a kind of lung which permits its wearer to live in the water as if he were a fish. Its automatic action lasts for two hours. The apparatus consists of a narrow-necked container of light metal carried on the back and containing air under strong pressure, a simple regulator which automatically equates this air to the pressure of the surrounding atmosphere, and two rubber tubes coming together in a mouthpiece that you grip between the teeth. The rest of the equipment is that of the ordinary undersea hunter, except that in cold waters you wear a sort of close-fitting overall garment of sponge rubber.

But now we were very far from cold waters! Whatever the depth the water remained deliciously warm, a rare phenomenon arising from the peculiar formation of the Red Sea, for its almost landlocked basin has no communication with the great oceanic depths where the lowest temperatures prevail. This sea, which lies in the warmest region of the globe, and to which no river brings fresh water, has a very strong concentration of salt. While the salinity of most oceans is about 33 per cent, that of the Red Sea is more than 40 per cent, and we had to get used to the particularly strong taste that it causes. The extra density of the water made it necessary for us to weight our belts more heavily. Without this ballast the diver, even with his equipment, would have great difficulty in descending. Generally speaking, it is astonishing that people ever manage to drown, since it is almost impossible to sink of your own accord in salt water: even someone who doesn't know how to swim can always float by simply lying on his back—so long as he remains calm and doesn't start breathing water.

The *Calypso* had returned from an exploration of several days in a region of massive long reefs, Shab Suleim and the Shab Djenab (Shab is Arabic for reef), a dozen miles to the west. Dumas had taken Professor Drach down to a depth of two hundred feet along the walls of this astonishing length of sub-

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marine cliff which springs up sharply from a horizontal base more than thirteen hundred feet below. They were dumbfounded by the magnificence of what they saw. For several hours they had swum about, to all possible limits, in water perfectly blue, with an incredible fauna around them. From their journey they had acquired new confidence in the non-aggressiveness of sharks towards men in the water. Since a scare or two we had at the beginning, we had taken every kind of precaution; we dived always in groups, keeping close to the reefal shore, each of us armed with a knife or edge-tool hung on the wrist by a cord. In addition we tied to our ankles a little bag of a shark-repellent product bought from war surplus; it was suppose to dissolve in the water and spread an odour which would drive sharks away. But perhaps the formula was wrong, because these creatures actually seemed to enjoy the stuff and used to come near us to sniff it. During our innumerable descents we were never once attacked, though sharks of every size would come by dozens to swim round the divers.

The *Calypso* was anchored in her usual place, a little white streak in an entirely blue world. One day, when I had completed my topographical survey of the island, I received my baptism as a diver. The heavy three-cylinder container of compressed air was strapped on my back; the belt, weighted with lead, was fastened round my waist; with eye-piece over my eyes and flippers on my feet, I climbed down the ladder which was hooked to the side of the boat. As soon as I was in water to the waist I gripped the rubber mouthpiece between my teeth, made sure that air was passing through properly, and let myself drop.

"Follow me," Dumas, our diving instructor, had said; but when I looked about for signs of my companions—I had been discovering, meanwhile, that unique sensation of being free not only from weight but from the fear of moving too far from breathable air—they were nowhere to be seen. I turned on my back and perceived that I was still no more than six or eight feet down. Almost within reaching distance the surface gleamed like quicksilver, cut through to just above my head by the mahogany hull of the dinghy. Its presence reassured me. Turning over on my stomach, I took a downward dive, slowly beating the water with my flippered feet. The bottom was near,

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only thirty feet farther, and I soon reached it. It was a carpet of rather dull sand pierced by a few sharp rocks of a darker colour. Twenty beats of my flippared feet brought me to the edge of a sharp slope, which seemed to descend for some distance. Without the least effort, and in a curiously fish-like manner, I began to go down this incline, gliding on my stomach, head downwards, in water so perfectly limpid that it seemed not to be there. Before me, not more than a few inches away, clouds of little rainbow-coloured fish rose up like snow under the blade of an invisible ski, moving peacefully, without sign of fear or haste, to twine among the coral branches.

Suddenly a sharp pain attacked my inner ear. I decided that it was the classic pain of divers, caused by excessive inequality between the outside pressure and that of the inner ear, which had not had time to adjust itself.

"If you feel bad," I had been told, "swallow, and blow hard through your nose. If that doesn't do the trick, rise a bit before you go down again."

After having swallowed hard and blown my nose I turned over and took a few steps, as it were, upwards. The pain disappeared miraculously, and I renewed my downward journey following a kind of narrow channel between powerful protuberances of coral rock. Sometimes a horizontal path covered with sand, or a change in the angle of the slope, broke the continuity of the glide. At the start I thought I would not stray too far, that I would try to keep directly under the dinghy, but for some time now I had forgotten these precautions. I had forgotten everything, and I moved about in the hitherto hostile element with an ease infinitely greater than in the atmosphere above. There was no more feeling of weight: adjusted to the exact density of the water, I found myself always perfectly balanced, head downwards or upwards, lying or standing. It makes no difference whether you are going down or up. You neither fall nor stumble; you do not sink or rise unless you wish to do so. A strange feeling of well-being, a kind of enchantment, takes hold of the underwater man. He moves as in a dream; he does not swim, but gently flies, in an invisible, perfect fluid.

Contrary to the accepted idea, the body can easily sustain very strong pressures, for it is nearly nine-tenths liquid, and

liquid is resistant to all pressure. Only the hollow parts of the body can be crushed: the lungs, the ear passages. But owing to a simple and ingenious device fixed to the mouth of the container, the chest, and rather more slowly the ear, can fill with air which is exactly at the pressure outside: this pressure must be the same, inside and outside our incompressible bodies; such, *mutatis mutandis*, is the normal condition of life.

In this way I arrived at the bottom of a kind of enormous bowl, and tried, as one would after a long walk, to sit down on the sand to look at the view. But sitting is difficult for one who has no weight, and what is the advantage of sitting down when you can rest suspended in space? Slowly I began to make a tour of this strange coral well in which I found myself, seventy feet down perhaps. Myriads of fish swam about, bluish *carangues*, azure parrot-fish with the hard beaks of coral-peckers, gaudy surgeon-fish, their blazing colours melting into the universal blue in which we all swam, eel-like needle-fish more than a yard long, their jaws full of tiny sharp teeth.

When I rose again, wandering to right and left, I saw some yards over my head an enormous white lozenge-shaped object which advanced with gently flapping wings, like some fabulous bird. It was a manta, giant ray of the warm seas. There are many in these regions: to the south-east of Abu-Lat they are so abundant that Dumas christened the corner "Mantaville"—after an occasion when, going out with Saout, he had harpooned a ray; seized with panic, it had dived down, dragging after it the frail dinghy. Fortunately it had not directed its flight to the deep waters, or the boat would have been lost, and Dumas took advantage of a brief pause on the part of the exhausted beast to take aim and finish it off with a rifle shot. And it had been hoisted on board the *Calypso*, an enormous flat fish with black back and white stomach, and a wing-span of nearly eighteen feet.

The present ray hovered above me, and for a brief instant I thought of the terrible tales current about them: if they encounter a diver—a pearl fisher, say—they spread themselves out over him and crush him, flattening him against the seabed; or else they wrap the luckless man in their enormous wings and smother him to eat him at leisure; or again they kill him with a blow of the poisonous sting at the end of their long

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sharp-edged tail. I felt suddenly terribly alone. But almost at once I thought of the ray which Drach had dissected on the *Calypso's* deck; he had shown us the toothless mouth backed by a ring of filters, allowing the creature to swallow, like the true whale, the plankton organisms. Rising in a slantwise direction I approached the ray, which was cruising peacefully around, seven or eight yards overhead; but it immediately put on speed and in a few seconds disappeared from my sight. To the onlooker there is an extraordinary discrepancy between the almost imperceptible movements that fish make with their fins or their tails, and the prodigious speed that they can instantly achieve.

Not long after this first descent I had another chance of appreciating the formidable strength of the larger fish. This time it was one of the shark family: creatures which did not cause us much anxiety, but which we admired for their lithe and nonchalant grace, gleaming sinuous spindles of the sea. They take off without warning and at lightning speed; the ten-foot shark that I met so disconcertingly at the bend of a coral wall had depth-dived with a terrifying suddenness yet without—as far as I could see—the flick of a dorsal, caudal or pectoral fin. I realized the probable futility both of the knife and of the edge-tool we carried.

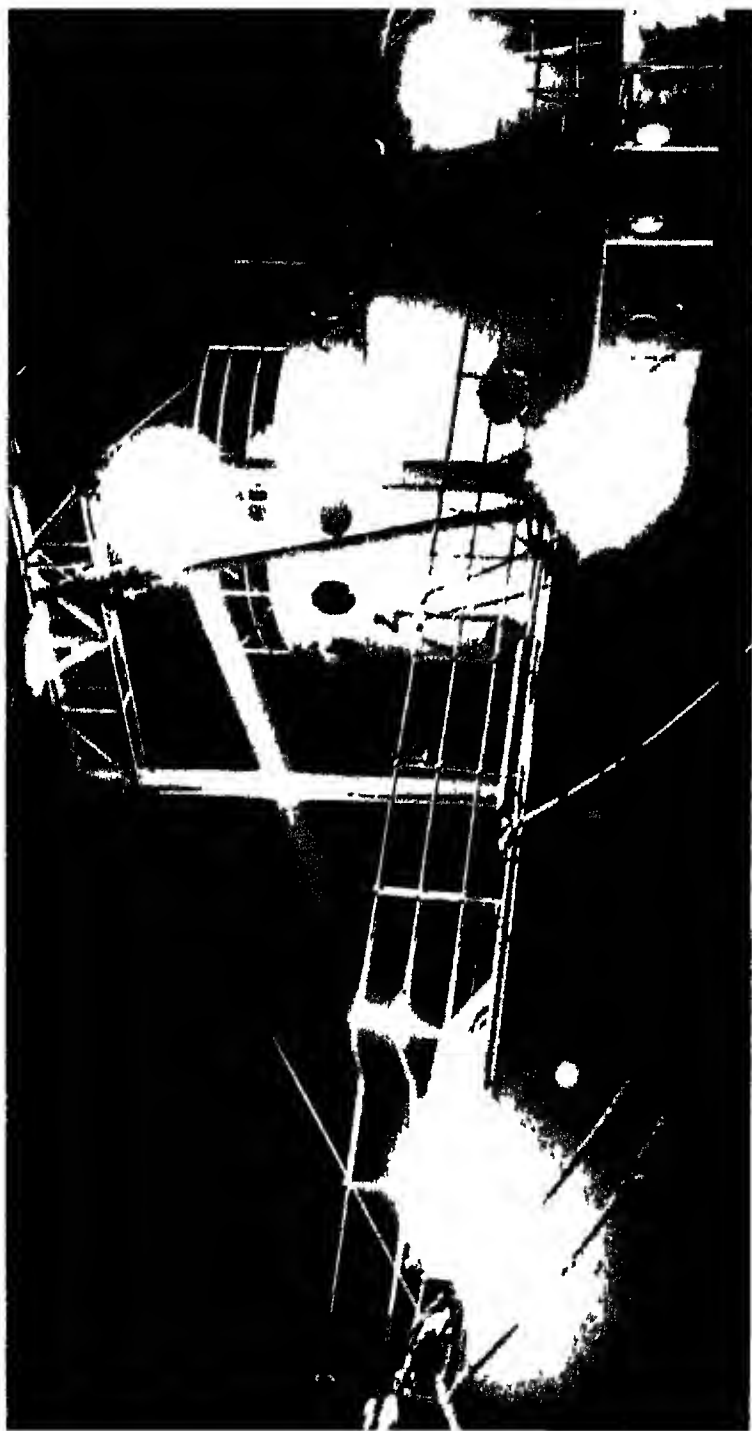
However, even with the kinds that might be man-eaters it seemed that there should be hope for a diver who keeps his head. The shark is apparently not in the habit of attacking straight away, but comes first to reconnoitre, to swim round and observe. As Cousteau, who knew its ways, remarked, it nibbles. This delay gives a man time to collect his wits and to prepare himself in case of a struggle. But it must be said that the innumerable sharks that we met in the Red Sea appeared more intimidated by the divers than the divers were by the sharks. It would seem that the diver had not much to fear from them, and that the so-called "man-eaters" are dangerous only to surface swimmers.

One can see why: in the water the autonomous diver becomes in a way part of the animal life about him; he swims, glides round at ease, observes the scene—and possesses arms, which are formidable appendages; no wonder that the shark which meets this unknown fish is inclined to be on its guard. The sur-

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face swimmer, on the contrary, has nothing of the fish about him; his state is much inferior. Seen from below, the surface appears a separate substance, an undulating film of metal which (by the phenomenon of total reflection) hides absolutely all that goes on above; thus the shark can see no more of the swimmer than his moving limbs, which sometimes disappear from view, and a bare or defenceless stomach which would be a very tempting bite.





2. Toulon, 11 p.m. Calypso makes ready to sail

Chapter Eight

TOILERS OF THE RED SEA

THE WEEKS FLOWED by. Each kept to his own field of work. The jars and cans were being filled with an unbelievable variety of fish, crustaceans, echinoderms, molluscs and worms. Cherbonnier had managed to bring down an example of most of the kinds of birds that lived on the reef, including some of these *paille-en-cul* or phaetons which appeared only at half-past four in the afternoon, uttering piercing squeals as they flew rapidly past in couples. We could never find out where they hid the rest of the time. They had two very long tail-feathers, narrow as straws, planted in their tails: Didi Dumas called them the "thermometer-birds". The men on the old sailing ships who had given them the name *paille-en-cul* were evidently not familiar with the clinical thermometer.

The chemical experts were finishing their observations and had made up a large collection of bottles full of samples of sea water for further analysis in France. As for the geological study of Abu-Lat which devolved on me, that was simple: apart from ancient coral which made up the mass of the island, there was nothing to be found but a few layers of fossilized shells—and in certain places, a kind of clayey soil produced very likely by the shells dissolving into chalk or lime. We discovered that the island had not emerged as a result of a lowering in the level of the sea (though this would have been a very possible theory since the "sea-level" that we take as the basis of our calculations is far from being constant) but as the result of an upheaval from below. One of the indications of this was the formation of geological faults in the rock. These very evident fractures followed three different directions, which were exactly those of the Red Sea itself, and of the Gulf of Aden which is its continuation in the south. The faults which had caused the birth of our island thousands of years ago were then part of a

gigantic system of cracks which had in turn engendered the Red Sea.

The *Calypso* used to leave us often for expeditions lasting several days. Sometimes she lingered in the distance, as on Christmas Eve when she should have returned to us from Jidda with fresh provisions and water. We had to wait three days for the delicious feast that we had been promised. And Dupas noted in his journal: "December 24, Christmas Eve." "December 25, still Christmas Eve." "December 26, *still* Christmas Eve. . . ."

Another time, we were running short of fresh food and had been reluctantly obliged to fall back on tinned stuff. Really we had no cause to complain, for fish and lobsters were always to be found in the sea. But in the burning Arabian heat we longed for fresh vegetables and new bread. One morning when we were all feeling disgusted with the dry biscuits we were given at breakfast, Dupas announced:

"Wait—I'm going to make some bread."

"Bread! That's fine. Will it take long?"

"Twenty minutes. Twenty-five at the outside."

An hour later, he was still absorbed in his task. It was "Sahara" bread that he was working on—the kind made by nomads of the desert. He kneaded a dough which had to be neither too stiff nor too loose, and threw it straight into the sand in a scooped-out hollow; he had previously heated this hole with a blaze of wood, then scattered the embers. The loaf was now covered up with burning sand. At this point Dupas squatted down and began to wait with traditional nomadic patience, sometimes prodding his bread with the point of a stick to test its consistency. Time passed. At last, the object of so many covetous glances was cautiously lifted out. Our mouths were watering busily—fresh bread, hot from the oven!

Certainly, we *did* have a crusty breakfast that morning. The sand was the cause. . . .

One day some men landed on the island.

Three Arab fishermen arrived in a *bouri*, a simple canoe-like boat with a rudimentary mast and an old frayed lateen sail, a wretched thing full of holes. They looked like the poor fishers of the *Arabian Nights*, thin, sinewy, almost black, for they had

been burnt by the sun since they were born. Some wisps of sparse beard, eyes like embers under a turban carelessly twisted round the head, and for clothing a loincloth as wretched as the sail of their boat—such was the picture.

Dupas was very soon on friendly terms with them. They felt instinctively, as primitive people do, that he liked them and did not look down on them. They spent forty-eight hours at Abu-Lat, and Dupas, squatting beside them, chatted about fishing, fish, boats, and even of his own passion for camels.

With a casting net—they throw it while standing at the end of the boat, after which they plunge into the sea—they catch great quantities of those transparent fish which are sometimes so abundant on the shelves of the reef that they crowd the water. Then, using these as bait, they lay out the lines on the well-stocked shelf, and draw them in heavy with tasty *carangues*.

Dupas told us that when the fishing was good a *bouri* worked by three or four men could earn about eight ryals a day, that is about five shillings a man. Sometimes it took them as much as four days to earn this amount.

They would land here once or twice a month in order to dry their fish. The boat would be run ashore, not head-on but athwart the sea; they would unload the catch and pile it up on a raised piece of rock. Then they would squat down, light a fire and make themselves some coffee which they drink boiling hot, in little sips, from tiny glasses that they hold in the hollow of their palms.

The coffee drunk, they would set to work, opening the beautiful *carangues*—they are something like a tunny-fish in shape—with a quick and skilful thrust of their razor-sharp knives. Another cut, this time in a scooping motion, and the guts would be whisked away. Then the creature, in two flat halves, would be laid out on the rock to dry for several weeks, at a sufficient height from the sand to keep off ocy pod crabs. Hundreds and hundreds of *carangues* would be cured in this way under the roasting sun.

If the voracious ocy pods did not scale the rock to reach the drying ground, there were thousands of other little crabs which would come to feast on scraps of the fish. Among these were tiny hermit crabs, which make their homes in the empty shells of gasteropod molluscs. They are also called *cenobites*

(anchorites) since each lives such a secluded life in its shell. On the beach of Abu-Lat, and also in the interior of the island, a perambulating shell would be inhabited not by a snail but always by a little crab. There were such quantities of them that, wherever you found yourself, you had only to be silent to hear one, or ten, or a hundred of them dragging their neat and spiralled houses along the coral stones. At the least alarm, they fold up claws, antennae and head and disappear into their suddenly motionless shell. We found them absolutely inoffensive and so comical that we felt a real tenderness towards them as if they were ridiculous young puppies.

The Arab fishermen explained to Dupas the mystery of the numerous tombs that we had come across on the islands in the open sea, at Marmar, at Malathu. These Moslem tombs were marked by a pile of flat stones, or sometimes by upright stones over the head, which is turned towards Mecca. Drowned fishermen? Victims of shipwreck? Of battle? No, pilgrims—sometimes a little mishandled.

The Holy City of Islam is the earthly goal of hundreds of millions of believers, and the *hadji* who has seen Kasbah and kissed the Black Stone in the city where Mahomet preached will know after death the Paradise of Allah. The pilgrimage to Mecca is the dream of unnumbered followers of the Prophet, from the Indonesian islands to Morocco, from Natal to Tartary. But the journey from Senegal or Sumatra to Arabia is long. Even in the hold of a ship, even on foot over hundreds of leagues, for the mass of believers it is a very expensive undertaking. Yet no one would hesitate to embark on it as soon as he has managed to collect, after years of saving, a sufficient amount. Alas! Reaching the holy frontiers of Arabia is not enough: in order to enter, each pilgrim must pay a tax¹ of twenty-eight pounds. For the Indian coolie or the fellah of the Nile who has also brought his wife and children, his old father and mother it is a colossal fortune; a hundred or two hundred pounds, from one who scarcely earns two shillings for a day's work.

¹ This entry tax was rescinded not long ago by Ibn Saud. Until then, it was the chief source of revenue of the State and of the royal family. Now that oil brings in incomparably more, it has been thought good policy to remit the pilgrimage tax, and thus please the great Moslem community.

Equally numerous are the *telouins* who try to smuggle themselves into the blessed land; indeed, there is an organized system of contraband. Standing in their fishing boats, their dhows or their *zarogs*, the ferrymen take in their human cargo on the African coast, and cross the Red Sea. Sometimes the crossing is uneventful. At others, the winds are unfavourable, and day after day they hardly advance at all against the short strong waves of this difficult inland sea. The unhappy travellers, often undernourished since birth, exhausted by weeks and months of journeying without rest, can offer no resistance to the storm. They die there, in the boat. The Moslem law forbids the body of a believer to be thrown overboard and insists on burial according to the proper rites, with the head turned to Mecca. Now there can be no question of secretly bringing these corpses on to the Arabian coast, where the landing will in any case be furtive and hurried to evade the vigilant myrmidons of those sheikhs of Hijaz. So they wait until some tiny desert island is passed, and those who have died before reaching their goal are piously buried in the dry warm sand.

On occasion the ferrymen themselves may become killers. Having robbed and massacred their passengers they land at some desolate island and bury the victims according to the rites of Allah. For they are none the less believers.

On an island shore, one day, we found a scattering of human bones: fragments of skull and jaw that were once part of a man gleaming white against the yellow sand. Under the tremendous sun, on this tiny tip of rock lost in the middle of the sea, life and death seemed to have the same value, the same insignificance. On the planetary scale there was scarcely any difference between myself, the living man, and this brain-pan lying there, a sort of stone on the sea beach.

Islam completely dominates the life of the Arabs, even in the heart of the seas, even in the heart of the desert. In the immense horizontal stretch of the stony sands, on the edge of the *mejbed*, the age-old caravan route, you find not only tombs marked by a flat raised stone, but sometimes also "desert mosques", rectangles of dark stones carefully laid out—perfectly symmetrical in shape except for a slight flourish in the middle of the long side which faces Mecca.

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We found one of these prayer sites on a microscopic island, shaped like the shell of a tortoise, quite near to Abu-Lat. It was hard to imagine that a man could ever have taken the trouble to scale the steep cliff, topped by an overhanging cornice, to reach this humpbacked, sterile plot, hardly thirty fathoms in length. I only managed to reach it myself with some difficulty, carrying the theodolite and its tripod on my shoulder in order to carry out some topographical surveying. And on this scrap of bare and almost inaccessible reef was drawn in pieces of glistening coral another desert mosque.

Chapter Nine

THE WORLD OF DEEP WATERS

IN THE COURSE of our cruise through the Red Sea we carried out, in all, four really deep diving expeditions. The first had been that in which Dumas, Drach and Dupas had descended along the Shab Suliëm to the place where the almost vertical cliff seemed to rest on a faint slope of sand. This description had excited me to the highest degree, for there, perhaps, lay the link between the coralline edifice and its mineral base. Up to now no one knows the exact nature of the atoll foundations anywhere in the world: ancient volcanic islands? Granite or sedimentary rock? Our divers had told me of the sandy floor where their descent came to an end. Unfortunately it did not occur to them to find out if the sand was thick, or what lay underneath: being biologists, they were chiefly interested in the manifestations of life, and, the pressure down there being what it was, there was quite enough to do with one kind of occupation.

It was understood, however, although I was still a novice in the matter of diving, that owing to the importance of the geological problem I would take part in the next deep descent. There was an absolute condition: I was to obey the slightest signal of the diver in charge, and to ascend at the first feeling of malaise.

Dumas stands on the last rung of the short ladder hooked to the side of the launch. His feet are already below the surface. With his right hand he grips the upright; with his left he gets the mouthpiece of the air-tube ready to place in his mouth. For two seconds he considers me in silence through the glass mask, his eyes bright under the impressive brick-coloured forehead surmounted by short thick hair:

"Tazieff, you understand the drill? Strict obedience under water?"

"I understand, Dumas. Off you go."

He slides into the water and circles round under the surface as he waits for us to be submerged in our turn. I would already like to be below myself, for in the air the diver with all his grotesque apparatus feels as heavy and awkward as an unhorsed knight must have felt in his armour—hindered even in walking by the encumbering flippers which get in his way at every move. The glass eyepiece becomes blurred; the three-cylinder container weighs down his shoulders, and the belt, weighted for particularly resistant waters, bruises the bare skin. But from the moment of immersion the perfect miracle occurs each time of perfect equilibrium.

We begin to move down into the water. Dumas leads, a curiously leisurely arrow, tracing a path of silver bubbles which fly towards the surface.

The intense swarming of life in the upper layers abruptly gives place to a world that is almost deserted, without motion, in which you can almost hear the silence.

We are moving along, parallel to the steep bank of pale sand cut here and there by dead rocks overgrown with dark weeds. Propelled by the slow, regular beating of our flippered feet, our stomachs less than six feet from the wall, we coast the vertical shelf which plunges endlessly down towards the dizzy abyss. We think we see rising towards us debris of coral, hills of sand, rare clumps of sea plants lightly waving—as if we were staying still and all this austere and sober *décor* were rising up towards us from the depths. With body tense, head turned in order to look below, eyes full of wonder behind the mask, we enter into a grand and awe-inspiring world, from which all that is pretty, quaint or picturesque at upper levels has disappeared. Henceforward, nothing more of the unfamiliar marvels of form and colour—nothing but this severe austerity. Only, now and then, we see the shadowy silhouette of some great fish sail nonchalantly by, and the slope continues its even course, leading always to inaccessible depths.

I turn my head, throwing an upward glance over my shoulder. Drach and Nesteroff are following, stomach to the wall, each at the end of his own vertical track of bubbles that look like polished metal. Strange machine-like creatures they appear, advancing by the slow supple beat of human legs, but robots,

THE WORLD OF DEEP WATERS

too, made rather frightening by the glass and metal masks, by the hard cylinders which form their backs, by the sinuous blue tentacles which wave between the big yellow tubes.

Then I become aware that the surface is out of sight, that the brilliant quicksilver gleam has disappeared. We are already so far down that the surface has ceased to exist for us. We are in a spherical universe of which we ourselves are the centre; each of us is at the centre of his own spherical world. Higher up, however, is a kind of brightness; lower down we can see the indigo blue of the enormous depths. But in spite of this, in spite of the close proximity of the shelf, the fundamental impression is still curiously that of a sphere, a perfect isotropy.

What makes us keep near the wall is the fear of sharks. Sometimes we see the silhouette of one of them in clear profile; sometimes the hideous mouth. In case of attack we like to feel that at least we have the rock behind us.

At this stage the light is diffuse, as if dissolved. The crystal-line transparency overhead has turned into a cloudy pale grey gleam; the glittering white of the coral sand has become dim. We are in a vast, unvisited, timeless world. And I have a strange feeling of having been in it before. Can I have known this whitish slope pierced by a few black points, this muffled glimmering, this marble silence, this indefinable menace, this cosmic indifference? Yes, it is like a couloir of ice and snow, very high up in a mountain imprisoned by mist, when all is silent, when the entire universe has disappeared, and nothing remains but a few grey patches. Here is the same desolate grandeur of the inorganic world.

Dumas has stopped. Under water one does not halt as on land: the act is more subtle, less abrupt; the beginning of a pause, the hint or ghost of a turn. He has stretched out towards us the spread fingers of his left hand and the thumb of his right: sixty. Then the right hand opens: sixty-five metres, nearly two hundred feet. The manometer on his wrist has told him this.

I still feel perfectly well. I consider my body: no lassitude in spite of the pressure, no sickness or pain. Even my ears are almost free from discomfort. I think of the rapture of the depths, that curious sensation of well-being which goes on increasing into a blissful and fatal drunkenness, the mysterious intoxication of those regions where the pressure is so great that a part

of the air you are breathing is dissolved in the blood: the resulting exhilaration increases with the quantity of nitrogen and carbonic acid that the blood contains. Often the narcosis begins at a hundred and fifty feet, but actually I feel nothing yet and I hope that the descent will continue. How magnificent it is to go down and down towards the unknown gulfs! But at the questioning gesture that I make to him with my thumb, Dumas replies with his index finger raised in a categorical "no". Well, it can't be helped. It is marvellous to have reached so far already, to be so incredibly far down, in the ashen light of a forbidden world. Stretched out horizontally, as if fixed by their hands to the wall, Drach and Dumas gather samples of weeds; stuffing one plant after another into the net bags that hang from their waists. On the slate hung from his wrist Pierre Drach takes notes. I envy the students in the ancient Sorbonne who will hear the lectures of this modern professor.

I look downwards: the cliff suddenly ends at a spreading bank covered with sand! But already I know that my hopes must fail, that we are still far from the bed of the atoll, that this terrace is only a balcony a dozen yards wide, below which the shelf will continue towards the abyss. I look for Nesteroff to share by means of signs the geological disappointment. But he has paused higher up, for narcosis is already stiffening his limbs. With the prudence of the experienced diver, he has known when to stop.

With all the power of my eyes I gaze at the scene. With all my body, with all my bare skin I endeavour to experience this extraordinary milieu; with all my conscious being I wish to absorb it.

Turning over with a neat kick Dumas stops to look at me; then with his thumb makes an imperative sign that I must ascend. Along the shelf, this time preceded by our trains of bubbles, we glide now upwards, our courses parallel.

My glass mask has been put on too tightly and its edge is chafing the skin under my nose. Trying to insert a forefinger between the rubber and my cheek in order to loosen the eyepiece slightly, I unluckily allow water under pressure to spurt inside. In a moment it has filled my eyes and ears. Only one little pocket of air remains, at the top of the tight mask. A second of anguish follows; I can see practically nothing—my nostrils are full of salt water. I snort violently to try to expel

this invading sea, but without success, for I do not know the very simple trick of turning on one's back, mask upwards, before blowing.

Upwards, quickly!

Neck bent, cheek on shoulder, I have managed to get one eye in the air pocket. It is not very comfortable, but at least it is possible to see. I now perceive that in these few seconds I have lost my companions because I have been letting myself rise vertically instead of along the sloping shelf of the reef. It is thick and cloudy below, and already far away. I am in the open water, the zone that we always take care to avoid because of sharks. They seem well behaved, but you never know! "They can have fits of temperament, too," Dumas was always saying.

I hurry still more, threshing my flippered feet as strongly as I can. I begin to swim with my arms which is not customary in diving. The edge-tool that we carry hangs from my right wrist; suddenly its point plunges violently into my thigh.

"Blast!"

What I feel is surprise more than pain. But I also remember that blood is supposed to attract sharks. I try to look at the wound, but if I bend down my eye hurts me. "To hell with it! So long as it doesn't bleed too much," I tell myself.

I work as hard as I can, but the surface is a long way off. Above me, suddenly, is the motionless long thin form of a barracuda, the huge cruel pike of the sea. Barracudas always intimidate me much more than sharks, precisely because of their apparent indifference. I swerve in order not to pass too close, at the same time watching it as long as possible out of the eye that is not submerged. But the disdainful creature takes no notice of me, and soon I lose sight of it. Unfortunately this is not all: less than ten yards away two sharks sail past—and I never saw them coming. The shock is violent but short, for they have already gone off, rapid and nonchalant.

The surface appears at last, shining in the sun. I stop for some moments a fathom below in order to conform to the rules for ascending from great depths; these rules call for a gradual decompression in the final yards of the ascent. Then I emerge, and empty my mask.

The smell of blood seemed to have had no effect on the pair

of sharks which had sailed past me. Is that too a legend? Or do sharks, like all carnivores, eat only when hungry? True, the little hole in my thigh let out no more than a trickle of blood; but it was probably not the sharks' mealtime. We often observed at Abu-Lat that there *were* definite mealtimes, at any rate for flesh-eaters. About five o'clock in the afternoon, notably.

Until then, all is peaceful. Detached and aloof, the carnivores sail past the crowds of tiny fish which show not the least anxiety. It is like this in the great plains of Tanganyika where majestic lions pad through herds of gazelles which continue to graze in peace. The birds, too, are calm; they hover, they fly round to try their wings or float placidly on the sea flooded with sunlight. Suddenly, at a secret signal, all restraint is gone. First, a slight shudder runs over the surface. In a few seconds the rippling swells into waves; the water is transformed; the whole lagoon now boils in a silent paroxysm of war. Innumerable shoals of little silvery fish fly in every direction, pursued by others which are themselves pursued by others larger still. Needle-fish like shining arrows spring out of the water, continually rebounding from the surface after their extraordinary leaps until they end by diving down, safe, as they believe, after a hundred yards or so of aerial racing. Flying-fishes also hurl themselves madly into the glitter with their wing-like fins to escape from the great *carangids*, the voracious bonitos, from sharks of all sizes which swoop on the hundreds of thousands of fugitives in their crazy swarm. Swimming over this scene of fury, even the grave pelicans become excited; they cast off their formal dignity and, with heavy beatings of the wings and feet trailing in the water, they rush suddenly forward to the rich hunting ground in which they plunge the whole of their necks to satisfy their enormous hungry beaks.

Twenty or thirty yards above, the boobies circle, scanning the sea with their attentive eyes, swinging their heads to right and left, until suddenly they swoop down like streamlined projectiles and, closing their wide black wing-span at the last moment, they disappear in the shower of little drops that follow a dive. A second later they come to the surface, a fish held in the beak, and each resumes its flight towards the downy snow-white chick, which waits for its mouthful on the chalky ridge

THE WORLD OF DEEP WATERS

of the coral island. In endless comings and goings, white phaetons cross the sky with urgent wing-beats, while the fishing eagles circle round before diving suddenly on to their prey.

Half an hour of fury and carnage, then calm returns. Once again the lagoon is peaceful and smooth, emerald under the topaz of the dying day. The sun scorches no more; its touch is friendly, flooding the islands with burnished gold. Shadows lengthen. Far away, beyond the dark blue line of the sea horizon, the mountains of Arabia lie in three parallel chains, the first of deep amethyst, the others of pale and paler violet, shading into more than thirty leagues of transparent twilight mist.

Chapter Ten

IN THE EMIR'S PALACE

FROM THE BEACH we watched the *Calypso* turning about, putting on speed, then standing out to sea. Three of us had just been landed on a geological inland mission. Seven weeks had passed since we had left Toulon; and all the time our beards had been growing in preparation for this day. They had grown well. Dupas' was black, cut short and round, and it made him look like an Arab with his bronze skin and black brows. Nesteroff, though equally sunburnt, had much less chance of not being noticed, with his light-coloured eyes and light brown hair. As for me, I had no hope at all with my small reddish beard, blue eyes and brick-red skin. At least we did each possess that indispensable attribute of the man who doesn't wish to be despised by the people of Arabia—a beard.

A good league away, the palm grove, dominated by its feudal castle, was a dark patch on the immense waste of sand. We had come ashore at the *minab*, the port—a pompous name for a creek where there were only three fishing smacks left high and dry, an old rotting *zarog* sunk into the sand, and what must once have been a fine motor-boat lying derelict. A Turkish ruin and, farther off, a thatch-covered hut made up the whole of the port installations.

From the straw hut two long thin men emerged in full floating robes, the guardians of the port. We shook hands with them: a long, long shake. Then we sat down on our heels and the conversation began; that is to say, Dupas and the Arabs began speaking. Half an hour passed in this way, and we were still waiting for a vehicle to be sent from Lith to transport our bulky equipment.

"Ask them if they have any idea when someone will come."

But Dupas knew their ways. We were not in some coarse

country of Europe or America. Here, there are formalities: no conversation can begin without interminable rites of etiquette; after these you speak of one thing and another, and only then do you broach the subject in hand. In this manner Dupas learnt that there were locusts in the district, that the December rains had not fallen, that the pasturing for the camels was good, that . . . And so one came to the motor-boat. It had been stranded there during the war, at a time when one side of the Red Sea was fighting with the other. What had become of the Italian sailors who manned it after they had come to grief on the sharp fangs of the rock? No one cared to tell us.

At last Dupas thought he had reached the stage of making the direct inquiry:

"Will anyone be coming soon from the Emir?"

They smiled pleasantly with their shining teeth:

"Only wait; you shall see. . . ."

And we waited, crouched in a ring, while the sun sank slowly towards the waves.

At the very end of the afternoon a lorry came rolling over the hard sand, filled with turbaned men whose *burnous* flapped in the wind. The Dodge pulled up, and the men, all smiles, jumped down and surrounded us. There were long, complicated greetings. We tried to imitate Dupas, but it was difficult to glance at him out of the corner of an eye and at the same time behave politely to one's *vis-à-vis*. You leaned over, one hand opened on the chest, saying, "*Alikoum salaam*"; you held out the right hand and touched the palm; you bent over once again, placed your finger-tips on your forehead, then on the lips. . . . "*Labès?*"—"Labès. . . ." Next please! And there were a dozen such greetings—a dignitary and the whole of his suite, down to the last serving man. Ought one to shake the hand of a servant? Not knowing the answer, we obeyed our democratic instincts.

Finally they took on our luggage and the lorry jolted us along as far as the main village. Like most of the natives of Africa and Asia, and also of Europe, the chauffeur seemed to be unaware that when the engine begins to labour one should change gear, and we heard the engine protest as we groaned along at ten miles an hour. A bad sign! I suggested to Dupas that he intercede on the vehicle's behalf. But, perfect diplomat that he was, he preferred to remain silent.

After a grove of stunted palm trees we came to a kind of square, at the end of which on a slight rise in the ground, stood the *Kas'ur* that we had seen from the ship—a square building with four massive towers at the corners. A few camels were browsing on the thin grass; some hairy Bedouins watched us go by, and in the blue sky the vultures hovered in wide gliding circles. We were in another world, and we might well ask ourselves what adventures awaited us in that medieval fort.

Our dignitary took us through the gate, where a guard presented arms at our coming. Crossing the inner court, we climbed a stairway against the wall, and entered, on the first floor, a vast rectangular room covered with magnificent rugs. There was not a single piece of furniture, but lines of cushions were placed against the walls. A score of Arabs who were sitting there rose to their feet as we came in. As they stood draped in their long white robes their thin, bearded faces seemed even darker beneath the spotless veil held in place by the double ring of the *agal* at the temples. The tallest, who was also extremely thin, was the Emir Saad ben Sheikh.

There were the usual greetings, the usual smiles. The Emir presented the dignitary who had conducted us from the port—his brother, the Emir al Bahar, naval commandant. Eventually we sat down, the Emir and ourselves in one of the corners, and the members of the court in another part of the rectangular hall. After the long customary preamble Dupas reminded the Emir of his earlier visit with Captain Cousteau, and the promise he had given then to help us: we had come now to ask his support in organizing an expedition to the mountains of the interior. The Emir acknowledged the request; inclined his head majestically; asked questions. He had an air of great dignity with his thin face and prominent cheekbones, his burning deep-set eyes, his commanding, sensual mouth with lips a little too thick.

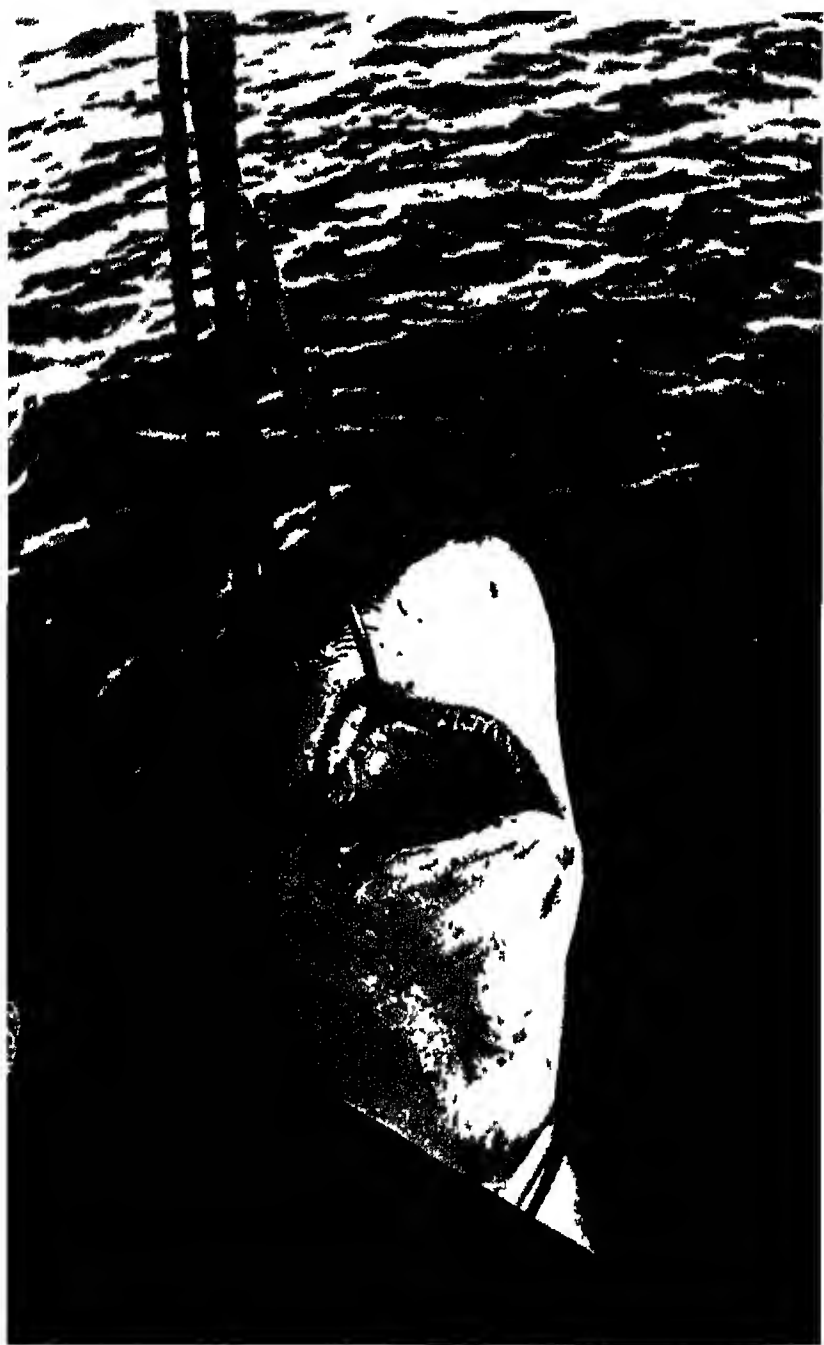
Nesteroff and I did not understand a word. My companion leaned over towards me and whispered out of the side of his mouth:

"Plenty to say, our Emir. But manner not obliging!"

The court retainers had the same distinguished air. Seated cross-legged, elegantly draped in their vast mantles, they had a feline quality, suggesting power in spite of their thinness. Their features were fine and sharp—real faces of birds of prey.



3. Three "professors" wash down the deck



4. *The dreadful mouth of a shark*

They were armed as obviously as possible: cartridge holders worn crosswise over the shoulders, revolvers hung on a leather belt, sabres, daggers, *yatagans* and *kingals*, in superb sheaths of damascened silver.

Two servants moving silently on their bare feet handed us tiny glasses; into these they poured from a considerable height a burning liquid, transparent and brownish in colour. Holding the little cup tightly in my hand, I cautiously watched the behaviour of the others. The Emir projected his prominent lips and drew in the burning liquid in quick sips. I did the same—then wondered what I could be swallowing. I whispered to Nesteroff:

“Any idea what we’re drinking?”

“Not a notion,” he mutters into his beard. “Would you say it was coffee?”

Coffee? Hm. . . . It was sharp, rather aromatic; and it took us a long time to recognize the violent flavour of cloves which completely masked the coffee taste. For that is what it was. Coffee, strongly flavoured and green—for the Arabs do not roast it. I swallowed the contents of my glass with a gulp to get the unpleasant business over. Immediately, nimble and noiseless, the attendant appeared. I dared not refuse.

Night fell. A powerful paraffin lamp was brought in. It hummed softly, throwing on to the whitewashed walls strange and unaccountable shadows. The servants had placed our belongings in the unoccupied corner of the room. They looked ridiculous, those bags, that suitcase containing the roll of film, and we too felt awkward with our European clothes in this setting, in the middle of this grave and courtly assembly.

The cups were collected; the attendant handed round tiny thick glasses into which he poured some boiling aromatic tea. Standing in the centre of the room he surveyed the company, always ready to refill, and refill again. And all the while Dupas, leaning towards the Emir, patiently set out to him our simple needs: a lorry or some camels to take us to the *djebel* (mountain), and a few men as escort. Sometimes the conversation, which flowed like a stream, seemed to meet invisible obstacles. The Emir would appear not to understand. The dialogue would be held up for a moment, then would run on again.

Time passed. The pattern continued—tea, coffee, tea again,

guttural words, the hum of the lamp in a hall so vast that it appeared empty although it contained more than twenty men sitting in a ring.

"Good!" Dupas had turned towards us, smiling broadly. "The Emir says that he will send a message to-morrow to the interior to find out the state of the roads, which may have been affected by the rains. If the roads are satisfactory, he will lend us a lorry. If not, the messenger will make contact with the nomad sheikhs, and get some good camels from them."

In our turn, we also broke into smiles, and I bowed towards the Emir to thank him in French, trying to make my face express gratitude. Everyone rose. There were more salaams, more smiles, and the Emir withdrew followed by all his court.

"If I've understood him properly," said Dupas, "we are invited to stay here."

All that night sleep deserted us. Not only were we in imagination already galloping along wild camel tracks, but, more prosaically, we were the targets of noisy squadrons of mosquitoes. The heat kept forcing us to throw off all the coverings, and each time the little beasts would return humming to the attack.

"Can't they bite us without making that fiendish row?" Dupas grumbled.

The attack from the air was presently increased by a terrestrial offensive. The clear, calm voice of Nesteroff confirmed my fears:

"Gentlemen, I regret to announce to you the presence in our immediate neighbourhood of a very powerful contingent of those *aphanipterae*, vulgarly called fleas."

The hours dragged on, all too slowly. Grotesque and pitiful, an ass began to bray somewhere outside. At last the cry of a cock pierced the gloom.

At dawn, a black attendant dressed in a long tunic brought us in a brass tray containing several little coloured enamel bowls, and we squatted down around the repast on one of the rich Persian carpets. With a prudent spoon I poked at a rather viscous stuff which might have been eggs lightly cooked in oil. I did not know if Arab politeness demanded empty plates. For the sake of our reputation, I hoped not. . . . A second dish held a sort of brown vermicelli, also cooked in oil. Other dishes

IN THE EMIR'S PALACE

contained beans, granular, sweet-smelling honey, and some large pancakes made from unsalted and unleavened dough.

Standing against the wall, our attendant watched us, and from time to time an immense smile split his pleasant ebony face, literally making it shine with the reflection of his magnificent teeth.

"What is your name?" asked Dupas.

"Mabrouk," he replied. "Slave to the Emir Saad ben Sheikh."

"*Slave?* Do you mean that he bought you?"

"Yes, he bought me. He bought me for much money." The knowledge of the high price that he was worth filled him with innocent pride.

"For how much?"

"Five thousand ryals."

Five thousand ryals! We translated: five hundred and twenty-five pounds!

"Well," concluded Dupas, "a man here certainly knows his price."

We looked at Mabrouk, smiling and proud. We really felt that we could never gaze long enough at this *object*, this chattel, belonging to a master who had over him the rights of sale, life or death. A real slave, openly admitted to be such, not disguised as a so-called free man in the fashion of our own world.

After our tea was drunk Mabrouk held a ewer from the usual height to pour a thin stream of water on to our oil-and-honey-covered fingers. He had scarcely done this when a bearded Arab entered the room with a deafening *frou-frou* of the white robe and sleeveless black linen mantle that he wore like a cape. It was one of the court officials of the previous evening, a man whom the Emir was putting at our disposal for our visit to Lith.

What hospitality! To look after us to the extent of organizing our leisure!

The Sheikh took us straightway to see the pride of all desert dwellers—the water sources. There were fourteen wells dug to the underground water-level, and we had to visit them all. Some were simply ringed by a stone kerb; others were marked by an imposing raised structure of masonry.

Leaving the thin shade of the palm trees we reached the

empty space by which the wells were surrounded, and there the Sheikh, with a wave of his hand, invited us to gaze. One after another, we came forward to lean over the dark hole, source of all life in these regions; to breathe for some seconds that smell at once damp, fresh, slightly saline, slightly putrid, too; then, straightening ourselves again, we would turn to the guide and express our admiration.

At each of the wells, slaves were drawing water. By means of a primitive bucket made of a goatskin, feet bound at the end and all hung on a very long string, they drew the water to the surface, then poured it off into a *guerba*, the leather bottle of the desert, also made from the skin of a male or female goat. The two full *guerbas* were hung on the saddle of an ass, and the gallant little beast went off trotting under the weight of two hundredweight of water and one hundredweight of slave seated across the load.

Most of these slaves are negroes, Sudanese or Somalis. But there are also a few of white race—Arabs, Yemenites. And we were told that in the interior there might even be Europeans.

They did not appear ill-used; some looked not only well nourished but diabolically strong. Dupas chatted with them; none seemed to complain of his lot. And besides, *Insh' allah!* Is it not the will of God? Many of them are sons, grandsons, great-grandsons of slaves. The state is as normal for them as it is for a man to be a man. Others recall more or less clearly being born "free" on the other side of the Red Sea and of having been sold when still very young to some trader who took them into Arabia. They have no rebellion left in their hearts—if they ever had any. They have not sufficient memories to know the nostalgia of that old Bar'k, described by Saint-Exupéry—a slave who had once lived as a *man*, who had been free, who had known what it was to be a man before becoming a thing. No, they are *bar'k*, slaves, and it is the normal state of life.

The wells formed a chain which surrounded Lith with palm trees and vegetable gardens. It was a meagre-looking palm grove in comparison with the opulence of the Sahara date trees. The little gardens were hardly better, with their few gourds and bean plants, and the "field of corn" was only a stretch of sand on which a thin green tuft appeared every five yards or so.

After this our guide made us go through the village; it con-

sisted of a main street less than a hundred yards long, and some alleys which threaded their way between blind yellow walls. This "High Street" was filled with a swarm of smiling Bedouins who slid in and out among the market stalls. After the dazzling sunlight of the open spaces we could hardly see. On sale were beans, corn, flour, dates full of flies, tomatoes, cucumbers, a few manioc roots brought from God knows where. Some things were unexpected; two or three shops had cases of magnificent apples, red and shiny, imported from Italy via Jidda; and boxes of American tinned foods.

Squatting on their heels behind their wares, the vendors seemed lost in a kind of dream.

We had seen hardly any workmen or craftsmen, except for two or three shoemakers and silversmiths. The first of these were crouching down stitching at sandals; the others were bending each over a tiny anvil or a little charcoal stove; in this was placed the nozzle of a pair of bellows that they worked with an astonishingly prehensile toe.

For the nomad Bedouins, Lith is the great city. In this province bordering on Hijaz, though the most populated in Arabia, gatherings of people are rare. The nearest towns are more than a hundred miles away: Jidda, Qunfidha, Mecca, Taif; and between them there is nothing but the desert. Lith is the market where you can find rice and grain, needles and tea. It is a place for holiday after the austere life of wandering in the sands, after the months of caravan journeys on the age-old routes which lead from one pasture ground to the next, from one water spring to another, halt after halt, week after week. Lith is the city, with its mcagre palm trees and its fourteen wells an elysium to the eyes of those who live always among rocks carved by the wind, and for whom the end of so much toil is a well of brackish or putrid water—sometimes a well that is dry. . . . Here, the nomads can take their ease. They proudly flaunt their rags in the alleys sheltered from the terrible sun. They lie down on the mats in the cafés, cool and shady nooks where for hours at a time they nonchalantly drink the infusion of green tea, hot and sweet, that the café-keeper prepares on his earth stove. They listen attentively to the story-tellers, eyes shining and alert, their sudden bursts of wild laughter revealing their extraordinary wolf-like teeth.

At the castle where we had returned towards noon, our friend Mabrouk served us, on the ground as usual, with a vast dish of saffron rice on which were laid some pieces of stringy mutton; this was accompanied by a *kasra* made from unleavened dough. We found it an excellent meal. The only difficulty was to swallow the rice without swallowing the flies.

There was no news of the messenger sent to the interior. We passed the hottest hour of the day at home, then sallied out again to mingle with such crowd as there was. Such was the chief village of the desert, with its deep shadows and hard light, its imperturbable camels, its ragged and noble-looking Bedouins. Vultures and buzzards continued to hover overhead, vigilant workers in the cause of public health. From the large open gate of a dwelling with windowless walls emerged majestically a slow and peaceful train of camels; a dozen beasts carrying distended goatskins of fresh water, and bags swollen with rice and corn. Some Bedouins, with serious countenances, were giving meticulous attention to each detail of the animals' harness, each fastening of the bales; and you felt the extreme importance of these minute attentions on which, in that ocean of sand and rock, the very life of men depends.

We, too, had hoped to leave that day; but the shadows were already lengthening, and the *muezzin* had climbed to the top of the minaret from which his piercing yet guttural voice summoned the faithful to prayer. Slowly we returned to our stronghold. The tranquil pace of life began to penetrate our being, changing our perception of things, altering our whole scale of values. It seemed that no more than an instant had passed, fleeting as a breath, since ancient Biblical times. "*And they came to Elim, where were twelve wells of water, and three score and ten palm trees; and they encamped there by the waters.*" (Exod. 15: 27).

Elim, Lith, what was the difference?

Chapter Eleven

GUESTS OR PRISONERS?

THE NEXT DAY, the long and fruitless wait began again. It was beginning to affect our nerves. The Emir remained invisible, and the sheikhs who took it in turn to be our escorts declared that they knew nothing of our expedition. "But *when* are we leaving?" Dupas continued to ask. "Wait, wait, the Emir will tell you," was always the reply.

Once more we strolled along by the *souk* and reclined on the mats in the cool shade of the Arab cafés, where Dupas chatted with the smiling Bedouins. In the caravansary we lingered among the camels which were stabled there, kneeling on the ground. We gazed at them nostalgically—symbols of long journeys through the desert. Full of tender feelings, Dupas caressed a leather thong, a *rabla*,¹ of hard, polished wood, a rope, or passed his hand in an expert manner over an animal's hump.

They let us go where we liked, through the alley-ways or the palm grove, across the patch of oasis which could not have been as much as a square mile in size. But we were always accompanied by a guard, bristling with revolvers and sabres. At first we were pleased to have the company of one or other of these men for they were agreeable to look at and their presence helped us to make contact with the people. Now that all topics of conversation were exhausted and we had grown familiar with the place, their attendance was becoming irksome. But to all the polite hints of Dupas that we would have preferred to wander round alone, they presented, with smiling amiability, their major argument—our own security.

"Bedouins, very bad, very dangerous."

And to make it clearer, in case we had not understood, they would illustrate their answer with a quick gesture of a hand cutting a throat.

¹ Camel saddle. Each nomad tribe possesses its own model of *rabla*.

"What humbug!" Dupas muttered.

On the previous night they had frequently asked if we were doctors. To our great regret, we could only reply: "*Toubib* 'la, not doctors."

Dupas explained, however, that among the people on the *babour* (the boat) there *was* a doctor and that when the boat returned to take us away they could all go there and receive attention. But these fellows wanted something more than promises; moreover, we could see for ourselves plenty of sores and ulcers that we ought to be able to treat. As for the rest. . . . In our luggage was a fine medical outfit, full of instruments, bottles and phials. This would have been a good occasion to use it, but we knew too little of medicine, and only the mercurochrome, the sulfa drugs and the argyrol were handed out freely. As for the internal ills whose diagnosis was beyond our powers, these we treated with aspirins or quinine, which could do no harm and at least bring a little consolation.

Lith, however, did possess a "doctor". We made his acquaintance. He was a Malayan, a native of Java, and he spoke a reasonably understandable English. Under his cap of quilted white silk the face he turned to us was narrow and weasel-like, at once impassive and distrustful.

"You doctors?" he asked, looking at us from slits of eyes.

To our reply that we were not, he persisted:

"One of you doctor? No?"

Then he appeared much relieved and let us visit his surgery: a pallet-bed, a little cupboard filled with bottles, a syringe, a painted metal injecting instrument, a big account book.

"He's as much a doctor as I am!" declared Nesteroff, as soon as we were outside.

He had probably been some sort of medical attendant in his far-off Indonesian home. He had come one day on a pilgrimage to Mecca, then had never left this happy land of Arabia where the profession of medicine asked for bluff rather than diplomas.

Once again night had come. Once again we were in our feudal *bordj*, lying on the sumptuous rugs. One of us was reading *La Chartreuse de Parme*, the only book that we had brought with us; the other two gazed at the ceiling and mused. The spirit lamp hummed gently. We had closed the shutters and the

doors (there are no windows in these hot countries), we had sprinkled the place with DDT, and now the flies were falling and turning over on their backs.

"He doesn't care a damn about us," said Dupas suddenly.

"How right you are!"

It did seem, indeed, that the delay was more than normal. Two and a half days already, and there was nothing to suggest preparation for the expedition. The Emir continued to be invisible and we were beginning to be exasperated by his smiling sheikhs, glued to our side the moment we set foot beyond the doors.

"Well, we shall see what happens to-morrow. If there is still no news, we shall have to admit the evidence, and when the *Calypso* arrives the next day, we shall go back on board."

We settled in for the night. The air was warm and heavy in the shuttered room. Given a choice between the stifling heat and the mosquitoes, I preferred the latter, and went out to lie down on the balcony. The limpid sky was brilliant with myriads of stars. Lying on my back, my face caressed by the light wind, my gaze lost in the glittering immensity, I abandoned myself to an extraordinary feeling of vastness, timelessness and peace. To go into the interior, to remain here, to go anywhere—what did it matter? Here we were, sentient scraps, lying between sky and desert. Our own brief flame would be all too soon extinguished. And then? Desert Arabia was imposing its fatalism on my spirit. The hours flowed by in a warm dream, broken only by the braying of an ass, the humming of mosquitoes, a dog's solitary bark.

Suddenly I was aware of bursts of laughter, snatches of voices speaking. These noises proceeded from the inner courtyard of the castle. We had never observed much of what went on in the clay-and-stone fortress which served for palace, government house and barracks. The laughing started again, mingled now with indistinguishable shouts. I rose to my feet and looked over the edge of the balcony.

On the opposite side, at the foot of the south-east tower, an open door sent a shaft of yellow light into the dark. I put on my sandals, and went down. Softly I crossed the court, approached in silence, and suddenly found myself transfixed before an extraordinary spectacle.

IN THE RED SEA WITH "CALYPSO"

Crouching on the much-trodden ground in the reddish flame of an oil lamp were about a dozen men, bearded, glittering-eyed, thin beneath their dirty rags. Sitting on their heels in a ring, trunk bent forward, one hand hanging open between the feet but the other closed at the end of the emaciated arm that rested on the knee, they were playing some enigmatic game of chance; and it was when they opened their palms that the exclamations and laughter broke out.

But what petrified me was this: all these wretches, gathered in this circular well of the castle like the Forty Thieves in their cave, were fastened together, one to the next. From neck to neck hung the heavy shining links of an iron chain. The first and last, who were seated on the ground, each had a leg stretched out in front and the ankle held in a yoke fixed to the wall, a yoke made of two thick blocks of wood polished by the years. Behind the men moved their enormous, tragic shadows, as if with a separate life, on the curve of the reddish wall.

It was a fantastic scene; I felt that I was living in some cruel legend. For a long time I stayed there, terrified and fascinated, like a child listening to a tale. At last, tearing myself away with a determined effort, I went to wake my companions and bring them to the prison. No, the sinister spectacle had not melted away like a bad dream: the "brigands" were still there in their cave, still playing their mysterious game. The dull gleam of their chains traced cabalistic signs as if in a Rembrandt chiaroscuro; and in the background the huge shadows continued to dance.

The next day we saw them again in full daylight, these prisoners and others. There were about sixty, some very young, some very old. The oldest had no chains; the rest were heavily festooned. We saw them wandering through the courtyard, gathering bits of wood for their fire. We saw them go to a kind of rubbish heap to satisfy their needs; we saw them eat and sleep; not for one instant could they separate themselves one from another nor free their necks from the weight of the enormous chain. So we did have neighbours—and they were prisoners risen out of the Middle Ages. What had they done to deserve so harsh a fate? Dupas took the risk of asking them questions, and we learnt through him that among them were murderers, defaulting tax-payers, insolvent debtors. Some were

certainly innocent, as in all prisons. The most astonishing thing to us was that many were there for adultery.

"You must understand," explained Dupas, "the Koran allows each believer to possess four legitimate wives and in addition as many concubines as he likes. But to take the wife of another—that's against the rules."

However, the number of Arabs who can afford the luxury of polygamy is small, and the temptation to commit the offence which leads a man to this place is strong.

The only criminals that we did not find in this curious prison were thieves. There is practically no theft in Arabia, so drastic is the punishment: once the sentence has been passed, the Emir calls the executioner who proceeds to cut off the offender's hand, after which the stump is plunged into boiling oil in order to stop the bleeding. For a serious theft both hands are severed.

The prisoners were not set to any special work, only deprived of liberty. Once a day, they prepared a meal: some rice and fish. They passed the rest of the time squatting in a shady corner, chatting, sometimes laughing, sometimes lost in a dream. At the hours when the *muezzin* summoned the faithful to prayer, they performed with measured calm the ritual ablutions, the washing of the feet, the hands, the face, the genitals. Then, indifferent to the weight of their chains, turning to that near and northern Mecca, they would send up to the one God of true believers the chanted litany of their prayers. To the accompaniment of the jangling ring of the chains they would kneel down, prostrate themselves, kiss the sun-baked earth, rise, then bow down and prostrate themselves anew, their foreheads touching the ground, their arms stretched out in the direction of the Holy City. At nightfall they would return to their dungeon and the guards would padlock to the heavy yokes the men at the ends of the chain. Thus there was no danger of escape. But where, in all conscience, could they have escaped to, these poor wretches, even if they had been able to get out of the fortress? Where could they possibly have gone? On one side stretched the desert, which has no mercy on a man alone; on the other lay the sea.

We were now more determined than ever to get back on the *Calypso* as soon as we could, not only because we were convinced that mysterious forces were opposing our projected ex-

cursion, but also because we feared vaguely that our present status in the tower might before long be changed for the worse. We hardly wished to share the régime of the lodgers on the ground floor, considerable as the ethnographical value would have been.

Our third day at Lith had been very much like the others, except that we had the pleasure of seeing the Emir once again. To the questions which Dupas pressed on him he had replied rather drily that we must wait, the messenger had not yet returned, but that the next day, doubtless, we would be able to leave for the mountains. Now the next day the *Calypso* was to come for news, and it had been agreed that if we were not at the bay, having returned from our expedition, the ship would return four days later, and then, if necessary, a week after that.

When, at the appointed time, the *Calypso* appeared in the distance, Saad ben Sheikh was nowhere to be seen. Dupas argued with the three court officials who happened to be there, begged them either to go and fetch the Emir or at least to obtain permission for us to leave, while Nesteroff and I, standing on the observation pathway, watched through binoculars the white ship which was steadily nearing the coast. At last the prince deigned to appear, and Dupas pleaded with him to lend us the lorry to take us to the *minab* with our luggage before the *Calypso* could turn round again.

"But why?" he asked in surprise. "To-morrow, without a doubt, your camels will arrive and you will be able . . ."

To-morrow . . . we knew it would be the same story. Dupas, however, persisted, tirelessly polite:

"If we must leave you, Emir, it is much against our will. We have been overwhelmed by your hospitality. Alas! We have no time left to carry out the project we had planned. Now, unhappily, we must depart, but we shall return."

"What, you wish to go already, when you told me that you intended to stay a fortnight in this country? Has something displeased you? Has any service, perhaps, been wanting?"

"No, Emir, your hospitality has been perfect . . . etc."

The *Calypso* reached the bay, hove to; we saw the launch making for the shore; we saw it turning back. It was as visible through binoculars at a distance of four miles as it was inaccessible. The boat stopped, turned round, and set off again

towards the south-west. Convinced now that our expedition would never be permitted, we found ourselves faced with these alternatives: to wait philosophically for the return of our companions in the hope that the Emir would not impose his hospitality on us for ever; or to escape. We began to work out plans. All things considered, it would not be so difficult to get away, provided that our status in the castle remained as it was, and that we were prepared to make the considerable sacrifice of all our photographic and other apparatus, as well as of the heavy bags of silver ryals. Our cameras were particularly dear to us; so, too, were the rolls of film we had already taken, not without a good deal of risk and excitement in some cases. I had, in particular, managed to secure, without rousing the suspicion of the guard, several pictures of the chain of prisoners; and I could not bear to think of abandoning these exceptional documents.

We all agreed that an escape should not be attempted unless, in four days' time, the Emir once again prevented us from making contact with the boat. Meanwhile, we amused ourselves by working out the method of escape to the smallest detail—rather as one plans a revenge. The scheme was well in hand as far as our reaching the bay: we would go out at sunset as if for a final stroll before turning in for the night; we would make for the palm grove, which was always deserted at that hour; we would silently wring the neck of our bodyguard and race off towards the sea. There was only three miles to cover; that would take about forty minutes, and the alarm would certainly not have been raised by then. It was at this point that complications arose, for we had to get to the island of Abu-Lat, some eighteen miles out at sea. If we could lay hands on a native boat, it would round off the trip. If not, there was only one hope: to inflate our rubber mattresses, then to lie face downwards and paddle them along.

But these plans were to prove unnecessary, for on the eighth day the Emir allowed us to go. Right to the end he continued the fiction of persuading his guests to stay. Were we not happy with him? Why were we in such a hurry? Our train of camels would soon be ready—why would we not wait? Meanwhile, our desires should be his commands! Dupas assured him of our gratitude, but gave him to understand that the *Roumis* have

rigorous time-tables which prevent them from remaining as long as they would like with their friends. Thus all came to an end with perfect decorum—though at no precise moment, and with no allusion being made on the one side or the other to the obvious fact that our request to journey through Arab land had been refused and that we were perfectly conscious that this was so.

Yes, Professor Lamare had indeed been right when he observed in the foreword to his *Geological Structure of Arabia*, a book whose pages we turned over in our castle-fortress while wistfully contemplating the white spaces yet to be filled in on the country's map: "Arabia is not a land where it is easy to gain permission to travel. Nine-tenths of those who apply are refused; and even the rare few who are favoured are never allowed to go freely where they will. The same itinerary is laid down for all travellers. To show a desire to visit other parts of the country appears to the authorities a sign of unseemly curiosity; it is met invariably with a polite but firm refusal." How true this is! I had read Professor Lamare's warning before we set out, but the ease with which Cousteau had obtained those impressive signed and sealed documents at Jidda, and the welcome we had been given by the Emir of Lith, had filled us with an optimism which I realize now was extremely naïve.

But was it only the over-sensitive nationalism of the Arabs that had brought this misadventure on our heads? On our return to Paris we heard that a geologist of the Aramco Company, hearing by chance of our wish to explore, had immediately put pressure on the Saudi authorities to prevent our journey. This foreign request was too much in accord with the naturally suspicious attitude of the Arabs not to be immediately granted. But I must admit that we were shown the door with the maximum of ceremony and politeness.

During these last few days, the Emir organized for us a motoring excursion into the desert. How we had longed for this! A journey into the desert! Exulting, we climbed into the 1938 Ford, and travelled about fifteen hundred yards before the chauffeur pulled up and, to our stupefied disappointment, explained that he had no authority to go any farther—there was the risk of getting bogged in the sand, and so forth.

The prince occasionally gave us to understand that he did

not wish us to suffer from boredom. In particular he invited us to go shooting; that is to say, he invited us to join the courtiers who accompanied him while he did the shooting himself. The *nuance* is slight, perhaps; but for lovers of the sport it was clear enough. The Emir, though, was a remarkably poor shot. Moreover, his dignity prevented him from approaching the game in any other way than standing stiffly erect. The sea birds that he intended to kill appreciated this noble stance, and generally flew away before he was within range. As he only shot the sitting birds, he was often obliged to walk the whole length of the shore. Whenever he made up his mind to try his luck, he would take a long aim and miss the mark; only once during three hour-long sessions was a single one of the little creatures hit. To think that we had always regarded Arab warriors as excellent shots! At any rate, not all of them could be so described.

On one occasion the Emir unwittingly gave us more entertainment than he realized. After the usual fruitless excursion, we were all sitting cross-legged on a carpet laid on the ground and had finished drinking the three traditional glasses of tea which a slave had handed us, when the prince suddenly uncrossed his long legs and lay stretched out on his back, a position completely at variance with the extreme dignity that he usually affected. Immediately, one of his retinue handed him a gun, a Belgian twelve-bore repeating rifle of the very latest model, while another sheikh pulled off the turban of a slave who happened to be within hand's reach, and knotted it into a hard ball. He waited while the Emir took aim, then, with all his strength, hurled the dirty white object into the air. The sound of a shot followed at once.

Dupas shook his head, scandalized.

"The Emir of Tarascon hunting hats. . . ."

Chapter Twelve

OCEANOGRAPHY

IT WAS GOOD to find ourselves once more at Abu-Lat, free to move where we wished. Our colleagues had nearly finished their various assignments; except for the taking of a few more specimens, hardly anything remained to be done. The *Calypso* was once again lying about a mile from the camp, and diving went on continuously. Guilcher had made carefully detailed records, not only of the mass of the island above sea-level, but also of the flat part lying just below. You could see him in long thin silhouette, his notebook in his hand, methodically surveying our little world, sometimes entering the water, without ever varying his phlegmatic pace. The flat shelf which circled Abu-Lat with an emerald ring was at some points two hundred yards wide. Indifferent to sharks or rays, in water to his calves, sometimes to his waist, Guilcher took measurements of the whole accessible zone. It so happened that the flat border rose slightly before coming to an end, and Guilcher took advantage of this kind of ledge, hardly covered by the sea, to examine the reefal outline. Seen from the shore the spectacle of this serious and absorbed man apparently walking on the waves was irresistibly comic.

He had also investigated most of the "negroes' heads" which dotted the lagoon; and having more faith in his own sight than in the camera had made careful drawings of them with his neat and skilful pen. These "negroes' heads", small coral peaks left dry by receding water and consequently dead, show how little stability there is in what one commonly regards as a fixed level—the surface of the sea. The overhanging ledges of the coral-line cliffs, a familiar enough phenomenon, are a further sign, since each of these ledges is the result of the corrosive action of the sea on calcareous rock, at the time when the surface level was at that particular height. For the level of the ocean must

have varied enormously in the course of the geological eras. And certainly the climatic changes, which in a few thousand years only could transform a temperate region roamed over by deer and lions into one covered by a layer of ice more than a thousand yards thick, would be enough to lower the level of the seas by a few dozen feet following the immobilization of the water in a vast glacial process. Conversely, a general warming of the planet's surface would lead to the melting of these millions of tons of ice, and would make the basic level rise. The "negroes' heads", like the overhanging ledges, are the consequence of these freezings and unfreezings which have affected the higher latitudes of the globe in the course of the quaternary ages, that is to say, during about the last million years.

Our collection of specimens of reef-building creatures was already impressive; but the biologists still felt that it was not complete. We willingly joined in the hunt, not only in friendship's name but also because it was an excuse for more underwater swimming. It was impossible ever to grow tired of watching these coral shelves with their extraordinary exuberance of life. It is on the shelf, in fact, that the corals themselves, like the calcareous weeds which accompany them and help them to build the reefs, find the most favourable conditions for their development.

The coralline growth is also responsible for the abundance or otherwise of fish. Most of all it affects the coral-eaters. Certain species do exist whose mouths are furnished with armoured lips, beaks in fact, which enable them to bite deeply into their rock-like diet. One day we encountered a number of these "hump-fish", as we called them. We were peacefully idling among the multicoloured riches of the shelf, some fifteen or twenty yards down on the windward side of the reef, when we came across a shoal of enormous grey fish, each with a sort of protuberance over the head; they were lying side by side in a kind of suspended motion, about a foot from the wall. From time to time one of them would propel itself forward with a vigorous flip of the fins, take a solid bite from the cliff and retire to its original position, where it pensively masticated its mouthful of stone. They looked like some legendary herd of cattle grazing under the sea. There they lay, their faces stubborn under the humped crown, alternating their pounce on the rock

with a kind of silent rumination and the sporadic ejection, by the anus, of a little whitish cloud. I approached, without their paying the least attention, and I took up some of this cloudy substance in my hand; it was masticated coral. Clearly, nothing remained but the stony part. The gobbling mouth takes in at once the living part of the coral (that is, the gelatinous protoplasm) and the chalky skeleton over which this substance is formed. The creature munches it all, retains the nutritious protein, and excretes the chalk or lime in the form of sand.

We observed these strange feeders on several occasions, and in our attempts to calculate the volume of the coralline rock that they transformed in this way into sand, we arrived at some startling conclusions. At the rate of a cubic centimetre to the mouthful (rather below the actual quantity), fifty mouthfuls to the hour, eight hours of work to the day, and assuming that there were a thousand hump-fish about the seven miles of shelf round Abu-Lat, they would make in an average year a volume of a hundred to two hundred cubic metres of sand—thirty thousand tons in a century. In these circumstances it is not surprising that coralline sand is so abundant in all the hollows where neither tide nor currents can carry it off, and that, in the interior of an atoll, where the water is undisturbed, the bottom may consist of a calcareous mud, of which a good part comes from this piscatorial grinding-works.

But genuine atolls are rare in the Red Sea; a few only are to be found, on the Sudanese coast, Sanganeb, the Green Reef off Suakin. By contrast, circular reefs are plentiful in the lagoons and most of them possess in their centre a *caye*, or enclosure, of sand. I could readily believe that all the sand in these *cayes* comes originally from the coral-eating fish. For though in other regions the rocks which border the sea can be destroyed by the eroding action of the waves, which turn even granite into shingle and sand, in these warm seas the waves do not work in the same way on the rocks, which themselves are different, being calcareous coral; since this is soluble, the action of the waves upon it is not eroding but corroding. Sea-water has much more effect chemically than mechanically on this kind of rock. Instead of breaking it into pieces and then pulverizing it, the sea absorbs it, to such an extent that there would be hardly any sand at all around the coral reefs if it was not pro-

duced by the coral-eaters. The evidence that the water absorbs the rock is plentiful: the overhanging ledges, the ridges or furrows which run horizontally along the cliff round Abu-Lat, several yards deep some of them, and pitted with characteristic little cup-like holes which are undeniably the result of dissolution. The "negroes' heads" of dead coral show all the characteristics of limestone eroded by water. Moreover, since the waves of the Red Sea do not produce stones and shingle, how could they make sand? It seemed to us, as we looked at the work of these fish, that most of the sand came from them.

Our last days at Abu-Lat were devoted to gathering "souvenirs": each of us went off on patrol in search of the graceful *Acropora* with violet or snow-white branches, of the massive *Porites*, sometimes almost spherical, and above all of the sumptuous vermilion *Tubipora*. Some beautiful shell-fish turned up to increase particular collections, *Pecten* or scallop, the cone-shaped *Troca* from which pearl buttons are made, and those large magnificent *tridacnes*, which wait for unsuspecting victims in their winding rocky galleries, yawning a little to display in their jewel-case of a shell—whiter inside than a lily—the flawless sky-blue of the mollusc lying within. Cherbonnier, without telling us, had even gone through some dozens of oysters and had found two or three pearls which, though neither very round nor of very fine lustre, had at any rate the unique sentimental value of being caught by oneself.

I waited impatiently for the ship to weigh anchor. Geology had had no luck in this expedition. Not only was the island we had chosen to study non-volcanic, but the Arab adventure had left us without the least idea of the nature of the rocks and direction of the folds of those mountains of which we knew, alas, only the bluish shape in the distance, noble and remote. My last hope of gathering some interesting geological observation from the journey lay in making a series of acoustic soundings over the Red Sea—a proposal I put to Commander Cous-teau. To-day, bathymetric surveys of this kind can be made easily and in a continuous fashion by means of the echosounder. Before its invention underwater sounding was a tedious business, for the lead had to be lowered and raised over a long-drawn-out period, and the findings even then were of

dubious value, since they were too scattered and far apart to offer more than a general idea of the depths.

Ultrasonic sounding has opened a new era in oceanography. Travelling at its normal speed, a ship fitted out with an apparatus continually sending out ultrasonic waves towards the sea bed, and recording without interruption the echo of its signals, can chart with perfect accuracy the levels of the area over which it is passing. The growing number of these contours is giving us an increasingly precise impression of the underwater map. From this it appears that the sea bed has far more variety than is generally realized, and that many fresh mysteries await the human understanding—the origin of submarine canyons and *gyrots*,¹ for example. How did these submerged valleys come to be formed? Or those high conical mountains? The answer to such questions lies, it seems, in the extraordinary changes that have taken place in the universal level of the seas. Was there some relatively recent epoch when Paris, like Bordeaux, lay two or three thousand yards above the sea coast of that time? Could such a thing be possible?

There is a monotonous poetry about keeping watch in the open sea. Leaning on the rail, a man is alone with himself. Hours pass and pass, and there is nothing to do but contemplate the stars swaying now all to the one side, now all to the other. There are hours on hours of listening to or rather vaguely hearing the regular throb of the engines, the hiss and flap of the water cut by the stern of the boat, the stealthy animal sighs given out by the wind in the rigging, and near at hand, in the wheelhouse the light clicking of the gyropilot: sudden rattlings separated by equally sudden silences during which can be heard the thin yet piercing call of the echo-sounder. It is an even ringing note, clear as crystal; the "ping" marking the passage into the water, the gentle response coming from the echo. One might be on land, listening in the warmth of a June night to a chorus of croaking frogs.

Time flows past; I am lulled by the rolling of the ship. I lay my hand on the smooth wood of the rail. Is it the stars that whiten the backs of the waves which are rushing up to meet us?

¹ See Appendix for some details of ultrasonic sounding, underwater canyons, and *gyrots*.

The very names of these stars take us back to our childhood—Antares, Altair, Betelgeuse, Sirius. . . . Or is it our position lights—so unobtrusive, though, that they hardly draw a shadow from the forward superstructure? Red light to port, green to starboard, white at the mast.

In the Red Sea there is little chance of meeting another ship unless you are in the main highway, the direct route between Suez and Aden. There, you have a continual procession of mail-boats, cargo vessels and, above all, oil tankers.

We were to encounter one of them that same night, when our diagonal path crossed this main route, and a gigantic tanker suddenly rose up on our left. According to sea law it was their place to give way to us. With a superb detachment, therefore, wholly unconcerned about practical matters, Saout and I were gazing at the lights on the bridge and at the port-holes with the dreamy fascination of people who for two months had seen nothing but coral reefs and Arab fishermen. But the tanker showed no sign either of slowing down or of turning aside. It continued on its way taking no notice of us at all, and without swerving an inch.

"I don't mind betting that they're all asleep," said Saout.

All at once he got to his feet.

"Good God! They'll be into us!" Rushing from the bridge, he seized hold of the wheel, while I unhooked the automatic pilot; then with all his strength he turned the wheel to the left. We passed the powerful vessel with a few feet to spare. It ploughed on towards the north without a sign of having seen us while we danced like a cork in its wash.

"Well, that was that!"

We resumed our course, and the gyropilot was put into commission again.

This "gyro" is a marvellous instrument. What it takes away from the poetry of navigation (*And it's oh the sturdy helmsman at the wheel!*) it gives back in ease and accuracy. Once away from the port, from the shallows and other such dangers, once the ship is ready to go for a number of hours in a fixed direction, the automatic pilot can be hooked on, linked up with the gyroscope in the hold, and from then on, with a continual click-clack like ping-pong balls, it will be responsible for keeping the course and restoring the balance at every lurch of the ship.

Trusting in this precious device to keep us safe while we moved along the Red Sea in a path empty of all other traffic, we turned our full attention on to what the echo-sounder had to tell us about the water's depths. I, in particular, was passionately curious to know what it would reveal of the buried contours under the heavy barrier of the sea.

As soon as we had left Abu-Lat, we crossed over the top of a formidable submarine cliff which, without warning, altered the depth-level from fifty or sixty yards to more than seven hundred. It was not even necessary to go and look at the echo-sounder, for the unusually long spacing between the *ping* of descent and the echo was quite enough to tell us. After that, the bottom rose progressively to four hundred yards, and over scores of miles the gentle ringing was repeated at intervals of two seconds, indicating that we were crossing over a vast uniform plateau. The sea was reasonably calm; the *Calypso* proceeded at a regular speed of eleven knots. Regularity of speed was an essential condition for our work in these lonely waters, that alone making it possible for us to determine (and then record on the chart) any unusual submarine features revealed by the graph of the depth finder.

No sooner were we in deep waters when the graph warned us that we were over the mysterious D.S.L.—the deep scattering layer. This becomes evident during navigation over depths of several hundreds of fathoms; it appears on the chart as an echo-mark between the surface and the sea-bed, as if an intermediary base were lying half-way down. Sometimes as many as two, three or four layers may be found, one over the other, at various depths. How can we explain these strange reflections of sound and ultra-sound? We can't, as yet: though, of course, theories continue to accumulate. Do they consist of shoals of fish, of jelly-fish, of shrimps, of squids, of microscopic plankton? Are they the result of some physical variation in the water—perhaps an abrupt change of temperature or of salinity? But a physical variation does not travel regularly upwards at certain hours, downwards at others. Yet that is what these deep scattering layers do; as soon as the sun sets, there they are, rising at a speed of about fifteen feet to the minute, and all through the night they remain near the surface, only to sink rapidly down at daybreak. It is difficult to conceive that merely a layer

of water more or less salty, more or less warm than that which surrounds it, could be subject to such variations of level.

On the other hand, this behaviour does suggest an intrinsic warmth attractive to living creatures. Thanks to the echo-sounders, modern oceanography seems once again to be in a position to overturn the most firmly established theories: after the phenomenal drying-up process that this science puts forward as the genesis of the canyons and *gyots*, it goes on to make us accept the idea that the great oceanic depths are far from being, as was universally held, "biological deserts"; on the contrary, the density of life to be found there is much greater than on the surface. It is the surface, in fact, which—by day, at least—often disappoints with its sparseness as soon as one goes any distance from the coasts, and above all from the coral reefs. We could appreciate this on board the *Calypso*, for how much time did we not spend lying in the false stem watching the marvelously blue void, the semi-desert of the open sea where only a few transparent jelly-fish might be seen floating by? At night, we should doubtless have been able to observe the upper part of the mysterious beds rising towards us. Unfortunately, our lack of funds—a common characteristic of expeditions which have no direct economic objective—had prevented our installing a system of powerful projectors for the nocturnal observation and photography of this zone near to the surface.

It had always been thought that it would be impossible for life to develop below a hundred fathoms, two hundred at the most, a region of eternal night where the sun's rays cannot penetrate. To be sure, some very strange fish had been caught in deep waters, but they were believed to be very rare, probably living on a starvation diet composed of the remains of creatures which died higher up and drifted slowly down. From the great depths mud had also been dredged containing various kinds of worms. But these worms must likewise have nourished themselves on particles of dead organic matter fallen to these depths, and one would have thought that such abyssal beings, chased from the well-stocked upper zones by other, stronger species, had been forced, in order to survive, to adapt themselves to the wretched conditions which must exist below the daylight limit. Now—a paradox, indeed—the echo-sounders reveal in this frightful darkness the existence of layers densely populated

with living organisms! But this paradox is only a reflection of our ignorance. We are beginning to learn that the reality is very far from all our previous imaginings. Thor Heyerdahl, during his prodigious crossing of the Pacific by raft, observed night after night a number of octopuses falling on to the *Kon-Tiki* after being projected into the air by violent expulsion of the water previously drawn in (on the principle of the jet engine), while by day the voyagers never saw any of them. He also noted that the catch of plankton was much more abundant by night, for while the sun was overhead a great part of the plankton would sink down to the deep.

It was in the course of this crossing that he realized what rich food potentialities were in plankton, and what it might offer to shipwrecked men equipped with a simple net. Alain Bombard took up this idea and applied it during that extraordinary odyssey in which he demonstrated, at the price of incredible effort and suffering, that men adrift on the vastest oceans—so long as they do not give up hope—*can survive for months* thanks to plankton and the fish which come to feed upon it. And what of the miraculously phosphorescent waters that we were encountering in these nights on the Red Sea? Where do they come from, these millions of luminous animalcula of which we never saw a trace during the day? Evidently it remains to be shown that these squids, this plankton rising in the nocturnal hours, form only one of the deep scattering layers marked by the echo-sounder. These beds need to be studied or photographed where they lie. William Beebe claims to have seen them. He was not speaking of the deep scattering layers whose existence was unknown at the time when he made the sensational bathysphere descent in 1934, but of the clouds of plankton that he saw swirling round, in the weak light of the head lamps. The biologists, however, did not take him very seriously.

And yet, to-day, we know that it is indeed these beds of plankton which begin to rise at twilight only to sink again at dawn. As the eminent oceanographer André Capart explained to me later, they do not come to contemplate the stars, but to eat the micro-organisms which live at the surface, where, by photosynthesis, they create organic matter from the sun and carbonic acid. Why do they not rise by day, these vast shoals of shrimps and squids? Because, among other reasons, they fear

the sun. In this they are like the herbivorous creatures of the African bush which will only leave their cover to feed after the warm hours of the day.

Here, then, is the sequence which links the great marine carnivores with the millions of floating micro-organisms: these last, which are infinitely more abundant than one would imagine—ten tons to the hectare—provide food for the plankton which in turn nourishes a quantity of fish, cetaceans, molluscs, and these again are eaten by the great carnivores.

And finally, these deep plankton beds have been *seen*. Fresh descents have been made to the greath depths with more highly perfected devices than those of Beebe. The bathyscaphe of Professor Piccard, revised and improved by Willm, has taken men into the eternal darkness of the abyss; Cousteau, describing what he saw through the heavy plexiglass window, added: "The deep beds of plankton are so thick that you might be moving through a *purée* of living corpuscles." Not only plankton has been observed by these divers, but also great octopuses and sharks to the very point where they touched the sea-bed, about four thousand feet down.¹

Whenever the D.S.L. appeared on our graphs, Cousteau would rush forward and instal himself at the echo-sounder, his long legs well apart, his hands gripped to the handles of the instrument. The deep scattering layers roused his most passionate interest. Though he had read all that had been published on these phenomena, he had been unable to come to any definite conclusions about their composition; now he hoped to go a little further in solving the mystery. Now that we were crossing the sea to make a tectonic survey of the ocean bed, two of us were there to keep a close watch on the double diagram which was being traced, second after second, on the sensitive paper; it was accompanied by a light smell of burning caused by the electric spark that the signal of descent, then the double echo, gave off at the needle's point. Up and down, up and down it ran, tirelessly reproducing under our eyes, on its miniature scale, through the comings and goings of an endless

¹ The bathyscaphe *F.N.R.S. III* has since gone down to 13,300 feet. Willm and Houot are the first men to reach such extraordinary depths. They came across plankton to the very end, where a shark came and looked at them through the glass.

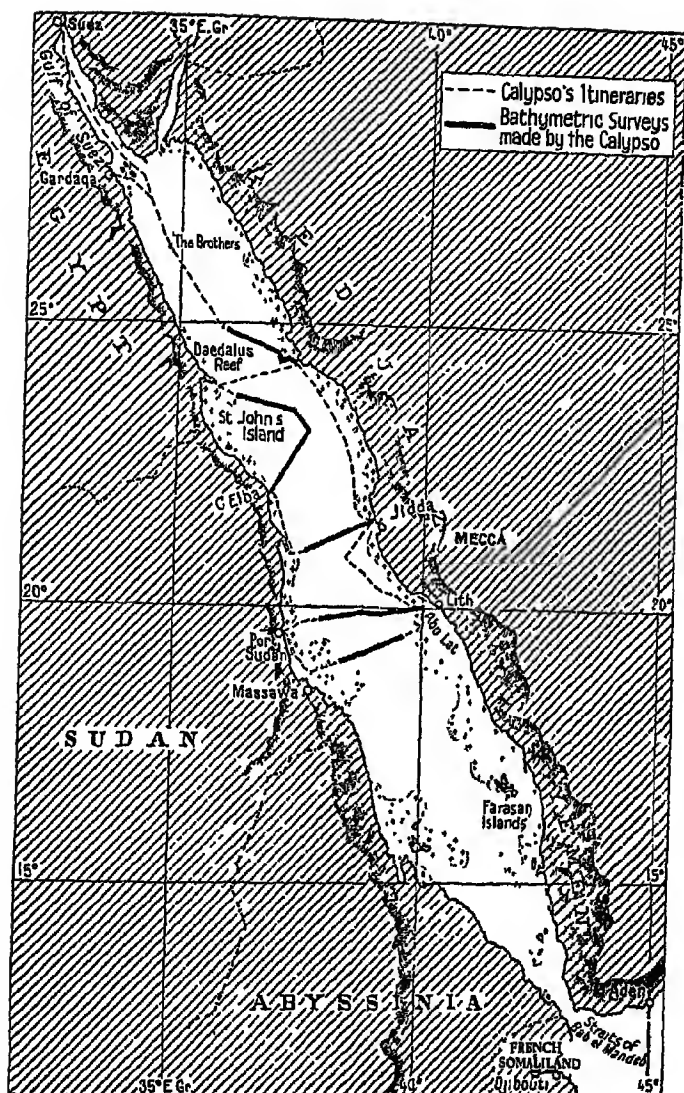
series of ultrasonic waves, the long submarine landscape over which we moved.

Night had fallen; the scattering layer had begun to rise so quickly that its outline on the chart was becoming hard to distinguish from that of the surface. Cousteau made meticulous notes on the different phases of this ascent, then, after leaving full instructions about navigating the ship and supervising the precious echo-sounder, he went below. The men of the watch were left alone on the bridge.

Since we had crossed over the enormous cliff to the east of Abu-Lat and had found the bottom fairly even at about 250 fathoms, I too had left the apparatus, tired of the monotony of the needle's labours, and was once again leaning over the rail. Lulled by the regular hum of the echo-sounder, I resumed my half-dreaming survey of the glittering constellations. From time to time I went as far as the chartroom to glance at the instrument, but nothing untoward was happening; we were travelling over a fairly horizontal bottom which sloped a little towards the west by means of a succession of tiers or ledges, from three to six miles wide, but only a few fathoms deep. Towards evening, we were over 350 fathoms. This descent in a regular arrangement of little steps coincided somewhat with my mental picture of a *graben*, except that the width of the steps was rather more than I would have imagined.

Reassured by this regularity, I returned to my contemplation of the stars. My watch was over, and the relief had come—Dupas and Nivelteau, to whom Saout had passed on the instructions before going to sleep.

I stayed with them, impatient to see how the central hollow of the Red Sea would present itself on the chart. Dupas and Nivelteau were enthusiastic amateurs of astronomy; any time that we found ourselves together at night, we liked to increase our knowledge of the sky, and our eyes passed from Argo to Achernar, from Vega to Delphinus. The regular song of our frog machine kept me from thinking about the depths. It must have been about one in the morning when I realized suddenly that the length of the echo had changed. It was more spaced out . . . the intervals were longer. Usually, the officer of the watch, who also kept an eye on the sounder, had no need to feel concerned unless a sudden precipitation of the signals indi-



"Calypso" in the Red Sea

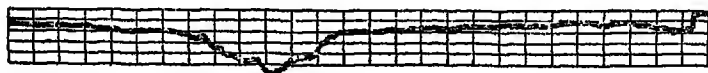
IN THE RED SEA WITH "CALYPSO"

cated an abrupt rising in the sea-ground, and consequently danger. On the other hand, nobody took much notice when a drop in already low depths was recorded. Thus it took me some moments to realize that something important was happening, to rush to the chartroom, and to discover that the bottom had dropped in a few minutes to nearly a thousand fathoms. A cliff was outlined, cut into by two or three narrow steps, very sharp and precise on the white paper. But by now we had already passed it, and were pursuing our course over an absolutely horizontal base. I rejoiced. It is wonderfully exciting to see something far beyond your power to reach carefully drawn for you as you watch. The same thing must happen to the seismologist who comes upon his instrument in the act of registering an earthquake in a far-off land. But it is still more remarkable to see the tracing correspond so faithfully to one's theory of sunken trenches.

There I stayed, firmly gripping the handles of the instrument, for the sea was becoming increasingly rough. The fine steel point pursued its tireless vertical motion, striking a spark at either end of the line—the upper one caused by the ringing note of descent, the lower, by the echo. This spark volatilizes the silver film over the paper, and a tiny cloud of smoke escapes while the line is registered in a deep burn.

According to the chart, we ought to have been approaching the middle of the sea, half-way between Arabia and the Sudan, and therefore over the central hollow. This large flat area corresponded to the base of the *graben*.

The outline of a *graben* always seems to consist of a rapid succession of sharp narrow steps which separate a relatively wide horizontal base from the upper plateau. I waited therefore till we had crossed before studying the shape of the eastern



*Sections of the Red Sea about the 19th and 21st parallels
Soundings made by echo-sounder by Captain J.-Y. Cousteau*

cliff which ought to have preceded the submerged Sudanese ledge. Suddenly, to my surprise, I saw the tracing of the depths fall sharply by fifty fathoms. Had we not yet reached the middle, after all?

The central "plain" was doubtless going to continue for several miles, twenty perhaps, before coming to an abrupt end at the opposite cliff. I had hardly formulated this thought when the needle, imperturbable as ever, recorded in some seconds a sharp fall of a hundred fathoms—a vertical drop of six hundred feet. Astounding as this was, it was not all: a new descent of a hundred fathoms had just been noted, then, after a broad stretch of two miles, another descent of fifty: we were over 1,150 fathoms. For the next four miles the bottom remained horizontal, then we were faced with a succession of rising tiers, symmetrical with those we had previously crossed.

Some minutes later we reached a flat section whose width was in marked contrast to the narrowness of the steps. It lay at some 850 fathoms under our keel, exactly in a line with the one that we had "flown over" two hours earlier. Yes, two hours already. . . . Time had sped away without my realizing, so excited had I been by this revelation under my eyes of a genuine rift: *not a wide horizontal bed edged by steps, but on the contrary, an extremely narrow groove, a sort of furrow wedged between steps lying nearer and nearer together.* Never before had anyone been able to observe such a structure; none of the theorists who had been trying for so long to explain these enormous accidents to the terrestrial crust had envisaged this particular shape.

Once the flat section was passed (like its corresponding section, about nine miles wide) the sea-bed rose again by successive and well-marked stages till it reached the Sudanese platform. We passed over this at about three in the morning. The new, the sensational were behind us. The graph once again was inscribing a record of monotonously even depths. Then, abruptly, I realized that for some little time the rough sea had been turning into a tempest, and that the *Calypro* was rolling and pitching in a frightful fashion. I felt very tired and was aware, once again, of the sad lot of oceanographers.

We arrived at Port Sudan in the morning. Vainly had we hoped for a little calm; the sea was turbulent to the end, and it was a group of wan and dispirited sailors who set foot at last on dry land.

Chapter Thirteen

ZIGZAGS IN THE RED SEA

WE SPENT OUR day at Port Sudan taking in fresh water, provisions, and fuel oil, for prices incredibly lower than at Jidda.

Port Sudan is not an interesting town. It is banal, like all colonial cities; and, being English in addition, it is almost intolerably lacking in the genuine exotic. Bored men on shore-leave, we conscientiously trailed our sandalled feet along the row of European shop windows, with their tinned foods, chocolate, and biscuits, their fancy shirts, colonial caps and ties, their gramophones, radios, records of Bing Crosby, and novels with lurid jackets. After the little European centre you come to a vast native market—but even this fails to be “picturesque” since it is held in sheds that would not be out of place in Liverpool. Moved by a sense of duty, we plodded on to the limit of the town which suddenly comes to an end before the immense desert plain, over which the burning air vibrates intolerably. We gazed at the horizon of distant mountains, and then returned to the port. We had finally exhausted the sad joys of the shore-leave in Port Sudan by taking a whisky on the luxurious terrace of the boring palace, and by sitting down on the benches of the public garden with the impeccable lawn. At last, we were back on board.

From Port Sudan, through the channel between the coastal reef and the barrier reef, the ship followed the coast towards the south, passed in front of Suakin, and turned round at the nineteenth degree of latitude, so that our course was set again for Arabia. A new recording parallel to the first was indispensable if we were to confirm the lie of the rift and to begin making an exact chart of the sea-bed.

At a slow speed our captain took the *Calypro* out of the charted channel and steered her through the deep channel be-

ZIGZAGS IN THE RED SEA

tween the coral shelves. Visibility was good, for now we had the sun behind us, and towards five o'clock in the afternoon we arrived at what the map calls the "Green Reef", one of the rare atolls existing in this part of the globe. It was an oval ring about three miles by two, formed from a circle of submerged reefs. Cousteau steered the vessel between two of these, and we advanced for some cable-lengths into the calm lagoon before anchoring in order to carry out a rapid reconnaissance dive.

We touched bottom at seventy feet which, as the echosounder had shown us, was the average depth of the lagoon. The bottom was horizontal, covered by a thick layer of almost white calcareous mud which enveloped us in a thick cloud as soon as we tried to scoop it up in our hands. This depth is about the same as that of the lagoons in the Pacific atolls, where it varies from seventy to a hundred and twenty yards. This curious similarity has up to now never been satisfactorily explained.

We did not linger, as we wished to be outside the danger zone before nightfall. At six o'clock, the sounder indicated that the depths had abruptly fallen from thirty to two hundred fathoms: we had gone beyond the continental plateau which, like most of the opposite shore, plunged straight down to the abyss—not by the sort of transition that we find in other seas of the globe, that is, in a faint slope whose average incline is less than five degrees—but in a sharp cliff at an angle of ninety or even a hundred degrees.

In deep waters the difficulties of navigation are comparatively few. And so our captain, after making his calculations and setting his course for the night, went to join the others below. There was no need to do anything more than let the ship go on till the next day, the only place at all problematical being the central "highway". As usual, I was leaning on the rail, absently listening to the crystalline ringing of the sounder as I waited for the next step of the rift. I felt wonderfully at ease: not only had I swallowed a dose against sea-sickness, but the sea was as smooth as oil. After the heat of the day, the night wind seemed to caress one's face, making it exquisitely cool. The ship sped along on the ebony sea, only the long oily backs of the swell showing any gleam at all.

Suddenly, separated up to now by intervals of a long second,

the *pings* became hurried; the echo-sounder began to throw out a hailstorm of little sounds each of which seemed to be trying to overtake the next. We rushed into the wheelhouse; I disconnected the gyropilot. Saout turned the wheel from "full speed ahead" to "stop". Saout seized the wheel; I leapt the three steps to the chartroom, anxious to see what was being registered of the depths. It was staggering! The bottom had soared giddily up to three fathoms, yet the ship continued to rush forward, the keel just a few feet from the reef.

Our commander sped up the narrow companion-way four steps at a time.

"What is it now?"

"Two fathoms——"

Cousteau entered, went down the three steps, and leaned over the dial.

"Incredible!"

But it was true. Though the official chart indicated that we were between two series of soundings, one of which had touched a mud bottom at 218 and 238 fathoms and the other had not reached bottom at 29 and 34 fathoms, we were actually floating over a pinnacle rearing out of the deep abyss. By day, Cousteau would have manœuvred with his customary skill, and there would have been no problem. But now it was black night.

"Five fathoms!"

The *Calypso* had not yet managed to stop when the reef broke off; ten yards farther, the bottom was down again to thirty fathoms. What was to be done? To wait for daylight would be dangerous; the swell could easily have driven us on the reef, and we had no means of knowing if there was another jagged point near by, ready at any moment to tear us open.

"Slow ahead," ordered Cousteau. We proceeded again, very cautiously, Saout at the wheel, Cousteau at his elbow, two men at the echo-sounder, all the others in the bows, leaning over the rails, and scanning as closely as they could the dark waters lapping against the stem. The depth continued to increase. Soon it was again below two hundred fathoms, and the base remained horizontal.

For a period of ten minutes we continued this painful advance, then Cousteau ordered "half ahead", and a few minutes

later we resumed our normal speed. An overwhelming sense of relief showed how great was the strain we had been under. One after another the men went below. Even our commander left at last, when fully reassured, and the ship forged along through the night to the regular beat of its two screws. Then, after all this, a *new* cliff rose up from the depths, and in a few seconds the sounder was ringing desperately: three feet, only three feet of water under the keel!

What followed was an exact repetition of the earlier performance, but this time all our companions appeared much more quickly on the bridge. It was frightening to see the outline of the coral ridge which was almost grazing our keel being traced, point after point, on the echo-sounder. But what would be the feelings of the men grouped on the bridge or the fo'c'sle if they found themselves hurled by a sudden terrible impact into this inky night? As in the old sailing days, a man leaning over the bows took the sounding with a plumb line, for an echo heard in the middle of the ship would have been too late to warn us. We were advancing you might almost say inch by inch, to the rhythm of cries sent back from the prow:

"Two fathoms! . . . Two fathoms! . . . Two and a half fathoms! . . . Two fathoms! . . ."

Then came the welcome call:

"Four fathoms! Six fathoms! Seven! . . . Getting deeper!"

In the chartroom, the graph of the echo-sounder showed that the reef was descending steeply.

After a short time we resumed speed, but the captain and a few men stayed on the bridge. They were not wrong, for on three fresh occasions we passed unexpected reefs, and three times felt the same sickening tension. It was like meeting the keys of a cyclops' piano, five black keys, four hundred yards high, rising out of a keyboard buried at the bottom of the sea.

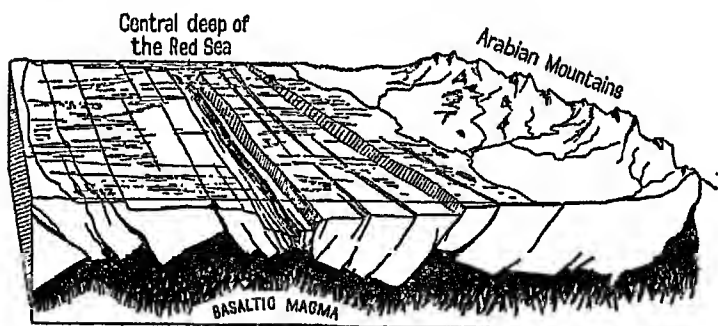
It was not until the middle of this eventful night, when we reached a cliff fault that threw the depth back to over 320 fathoms, that Cousteau regained confidence in the chart and went below to sleep.

What is the true origin of these vertical ramparts, these monstrous factory chimneys? The two flat shelves which border the Red Sea, on the east as well as the west, show a profusion of these sharp uprisings. Should we conclude that—be-

IN THE RED SEA WITH "CALYPSO"

fore the gigantic cavings-in which have caused, among other things, the Red Sea depression—Arabia and Africa formed a single almost horizontal surface? On this a number of hills would have stood, some tens or hundreds of yards high. When the waters, breaking over the shelf of Bab-el-Mandeb, filled up the long furrow, they probably could not bury these hills deeply enough to prevent the life of the polyparies and these continued to grow at the peaks. The caving-in continued; but the deeper the base of the coralline construction sank, the more the madrepores struggled to build towards the top, in order to stay in the upper waters which are vital for their survival.

The rest of the crossing was without incident. The new tracing given by the echo-sounder excited me by its likeness to the first. It was becoming possible to see how the various cliffs (which represented the original faults) lay between the two, and to begin to sketch out a plan of the *real* shape of a *graben*, as it appears when nothing happens to warp or mask its features. I



The shape of the Red Sea bed

would have given much for the ship to go some twenty-five miles towards the south in order to take a still more southerly survey; but lost time is of all things the least recoverable, and Cousteau had none to spare for lingering. We had to wind up the camp of Abu-Lat and set our course for Europe.

Failing the southern graph, I would have liked at least two or three other parallel recordings made during the return voyage. The time question no longer allowed this, and we ended by compromising: we would cross the Red Sea in zigzags and

ZIGZAGS IN THE RED SEA

not in parallels, so that we might survey two or three times the water's width. Unfortunately, these recordings proved too oblique, except for the first, at the height of the twenty-second parallel, which was still relatively perpendicular in the direction of the great faults. It seems, moreover, that to the north of the 22nd parallel, the bottom of the Red Sea must have been more or less hidden under volcanic lava before the central furrow was formed, a circumstance which, added to the obliquity of our three last findings, did much to prevent our arriving at any valid conclusion.

On two occasions we touched land in the course of our Red Sea passage, once to the north of Jidda, once at the island of St. John's. In Arabia first, we penetrated into the Sherm Oub-hour, an arm of the sea penetrating three or four miles into the land. We hoped to find some evidence of a fault below, with the help of our echo-sounder. On either side of the Sherm a desert stretched out into infinity, absolutely flat; it had been levelled by erosion. If a fracture existed anywhere here, this channel could have preserved it from being totally flattened over by the same eroding process. And in fact, after several hundreds of yards of navigation over a perfectly horizontal base, the highly sensitive apparatus revealed an abrupt step, nearly a fathom high, which was followed again by a horizontal area. Nesteroff and I went to inspect this in diving gear, but, over these muddy grounds the water was very far from having the beautiful transparency which we were used to meeting on the reefs; at a depth of sixty feet, you were lucky if you could see more than two yards before you, or distinguish a change of slope through the whitish mud which enveloped everything. The place was none the less interesting for that. We were able to see how effectively still water can protect the most insignificant rock formation from atmospheric erosion. We realized, too, that in the formation of a *graben*, besides the sheer cliff-like descents of the major faults, there are also numbers of smaller breaks interrupting the regularity of the horizontal areas.

When we climbed again on the bridge, we found two Bedouins on board, one timid and self-effacing, the other inquisitive, sly, something of a comic. The second must have cut short the

usual polite exchanges, for he was already asking if we had any arms to sell. While at Lith, Dupas had discovered that the Arabs were interested in two things above all others: arms and aphrodisiacs. The latter were of particular concern to those whose wealth allowed them to practise polygamy. The pleasures of love are highly prized by the Bedouins, who are forbidden alcohol and even tobacco by the Koran. But the numerous conversations that Dupas had with them seem to suggest that they often feel considerable anxiety about their ability to carry out their conjugal duties. In spite of this, they are fiercely jealous, and during the whole time that we spent with them we were never able to gaze on one of those gorgeous women whom we had briefly seen at the time of our excursion into the desert in Laussac's jeep. Once only, at Lith, had we caught a glimpse of two Bedouin women, veiled, slim and proud. As soon as they thought they were being observed they turned round and went back into the ramshackle building they had just left. Yet we were still about fifty yards away.

On the *Calypso* a bargaining exchange had begun between the Arab, bearded like a brigand, and Dumas, the only one of us who possessed any weapons. I do not know who is the more passionately enthusiastic about rifles and daggers, a Bedouin or Dumas. The latter had the advantage of being able to replenish supplies when he wished, and so, after Jacques Dupas had once more served as interpreter for the discussion which in these regions is obligatory before every transaction, he did not hesitate to sell the Arab a gun that he had been keeping carefully oiled in his cabin.

"If only I had known!" Didi observed regretfully, when we were under way. "I would have brought a cargo of the stuff along with me."

It is quite certain that whoever comes to Arabia with firearms will quickly be able to dispose of them at fantastic prices.

The next day the *Calypso* anchored on the shelf of the reef fringing the island of St. John's which the Greeks of antiquity named Topazos. Precious stones have been mined there over thousands of years, and, though it is now deserted, we found quite recent traces of occupation when we landed; two houses made of rubble; baked earthenware jars; empty bottles. The island, which is more than six hundred feet high, is a noble

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pyramid of dark cruptive rocks hollowed into deep ravines, without a bush or tree. Everywhere on its sides are excavations, mining galleries, mounds of discarded rubble.

We crossed the island, climbing over its highest point, and we had the chance of seeing innumerable fragments of these "topazes". They are really no more than semi-precious chrysolites, of a translucent olive colour, with an almost oily gleam. These chrysolites are found only in the most basic rocks, that is to say in those deficient in silicates. St. John's is formed of this rock; its dark green colouring gives an almost tragic austerity to its desolate landscape. In curious contrast, a ring of short white coral runs all round the base; it is a fossilized fringing reef, now risen several metres above the surface of the sea.

While we clambered about the island, Dupas went under the water in search of black *gorgonia*. These polyparies, which grow in vast sinuous bushes that wave in the swell, provide the Moslems with the beads for their prayer-chaplets. Dupas had swum for a long time about the shelf, gliding through the narrow channels, penetrating into the submarine caverns. The problem was not to find the "gorgons" but to gather them, so hard are the stalks. He came up finally with a complete bush, the central stem of which was five inches across at the base. From this moment, and until our arrival at Toulon, it was impossible to see anyone on board who was not carving or polishing a piece of black coral. It became maddening to watch! At Port Said, where the usual legion of bearded vendors had invaded the deck in a matter of moments, this abundance of holy material created an extraordinary sensation.

Before leaving St. John's, when the *Calypso* was all ready to go, I was allowed to undertake another deep dive. Nestoroff and I made a vertical descent, and for the last time we were able to look at the miraculous world below. We passed the colourful exuberance of the first six fathoms, then the tranquil zone of the alcyonarians with their delicate corollas; finally, we glided along a sheer wall where there were fewer and fewer evidences of life. The shining surface was lost to sight and we found ourselves very much alone, far from the living world, in the cloudy regions of the greater depths. I would have liked to go farther, or at least to linger for a while in this supernatural atmosphere.

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My companion, though, was suffering from the intoxicating effect of the increasing pressure. At two hundred feet he already thought of ascending, but he was still able to control his movements. It was when the manometer touched two hundred and thirty feet, and I was still continuing my descent, that he began to feel really overcome by narcosis. Shaking himself out of the poisonous haze he turned round and began to rise. I followed him towards the sun.

Part Two

CENTRAL AFRICA

Chapter Fourteen

THE HAUNTED VOLCANOES

THE UNEXPECTED PROFILE that we had discovered of the Red Sea bed differed from all those which had hitherto been traced of its cracks and valleys. What is more, it gave valuable support to the theory that a *graben* can be engendered by a prolonged stretching or expansion of the terrestrial crust. The origin of these great ditches has always been a source of heated argument between holders of the expansion theory and those of compression. The two opinions are equally tenable, and rifts probably exist over the earth's surface resulting from both these modes of formation, the thin shell of the globe being as liable to break by continual stretching as by contraction beyond the limits of resistance. When erosion has done its work sufficiently the geographic result will appear identical. A diagram will perhaps make this clearer.

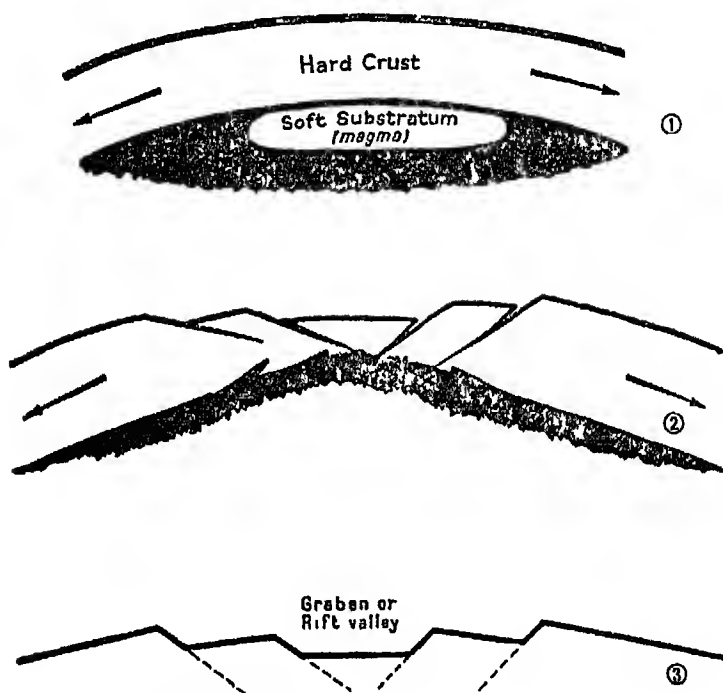
And yet, if we look into the mechanical laws, we see that they would hardly allow a relatively narrow median furrow to be created only by compression. This, in fact, could do little but bury the central block more deeply. Stretching, however, might very well create such a furrow, and supporters of this theory would seem to have the stronger case. All the same, they do not manage to explain in any satisfying fashion the rising up of those ridges called *horsts*, an imposing example of which is the mountain mass of Ruwenzori, parts of it over 15,000 feet high, on the edge of the *graben* of the African Great Lakes.

To discover the truth is, at first sight, hardly a commercial proposition—for the moment at least. However, the pure curiosity which impels geologists and naturalists to study these great furrows has already given certain concrete and practical results, as for example in the exploitation of those astonishing "floes" of sodium carbonate which form on the surface of Lake Magadi in the Great Rift of Kenya, floes so thick that they sup-

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port the heaviest lorries driving back to the plant. It should be possible, too, to utilize the enormous power of the volcanic "chimneys" which in certain parts of the rift enclose powerful reservoirs of steam under pressure. It is not unlikely that, a few years from now, this "red coal" will be one of the world's chief reserves of energy—a reserve that is inexhaustible.

Very likely there are still treasures of this kind to discover in



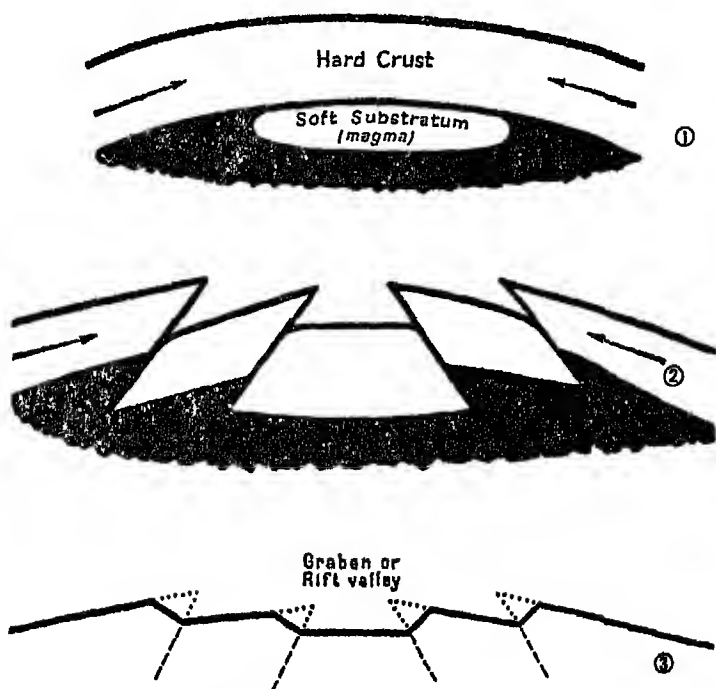
1. *Start of diverging pulls.*
2. *The formation of normal faults and subsidence between the faults.*
3. *Present state.*

the subsidence hollows. But it was with the purely platonic idea of seeing if such a structure could still be discerned under the layers of sediment and other matter that cover the great rifts that I jumped at the chance offered to me to return to Central Africa.

I visualized at once a planned itinerary of over fifteen

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hundred miles, which would let me journey all along this gigantic depression, with its trail of volcanoes, from Tanganyika up to the north of Ethiopia. I acquired a land rover capable of taking every sort of surface, laid in a stock of pharmaceutical products for the possible needs of the two or three members of my expedition and certainly of the natives among whom we would be living; I bought a quantity of film



1. *Start of converging pulls.*
2. *Formation of inverted faults, and forced subsidence into the magma.*
3. *Surface after erosion: present state.*

to record the various stages of the journey, some new gadgets such as pocket spectrograph, magneto-electric recording instrument, and three-cylinder diving gear; and asked my friend Louis Tormoz, in his role of mountain guide and ski instructor, if lakes, craters and deserts tempted him sufficiently to make him miss an Alpine season. Louis is a great strapping

fellow, thickset and taciturn. At the idea of leaving for still-hardly-known corners of the African continent, his brown eyes began to sparkle, while, under the tousled mop of hair, his honest face, tanned with wind and sun, broadened into a smile.

"You can count on me!" he said.

On my arrival at Goma, on the picturesque shores of Lake Kivu, I learned with pleasure that a team of scientific research workers had just discovered a new source of energy at the bottom of the lake. This would be only one example, very likely, of the economic possibilities of the subsidence regions. These men had just proved by experience the validity of the theory that one of them, the chemist Jean Kufferath, had suggested five years earlier. Yes, he had been obliged to wait all this time for the chance to go back to Africa with the second expedition that the oceanographer André Capart was directing on the great lakes.

In analysing the specimens of Lake Kivu's deep water, this wily Kufferath had observed that it was exceptionally rich in gas, particularly sulphuretted hydrogen, carbon dioxide and methane. The analysis of samples drawn up at regular distances the whole way down showed that the degree of gas, like the density of the waters, changed abruptly at a certain level. There was a precise separation into two layers, one over the other, of different density, each about eight hundred feet thick; and the pressure that the weight of the upper layer laid on the lower one allowed the gas to be absorbed there in very strong proportions.

This discovery led Kufferath and Capart to conclude that the lower stratum, the more dense of the two, evidently, was neither penetrated nor stirred up by the slow or rapid currents which agitated the upper layer. The water in the depths of Lake Kivu, prevented from flowing outwards by the basin-like form of the lake bed, protected from all internal movement by their extreme density, crushed under 60 or 70 pounds of pressure to the square inch, undisturbed and unmoving for thousands of years, has been able to absorb enormous quantities of gas—some volcanic, others created by the decomposition of organic matter. Kept in solution by pressure, these gases would escape as soon as the pressure ceased. Kufferath had the idea that if one sent down a pipe or tube and pumped the deep

THE HAUNTED VOLCANOES

water the gases would be released at the surface, like the contents of a bottle of champagne or beer with the cork removed. Better still, once the operation has begun the pumping would be unnecessary, since internal pressure would from then on force a column of deep water through the tube until it spurted into the air above; a constant supply of liquid sediment would



account for the equally constant liberation of the combustible gas, and all one need do would be to collect it as it appeared.

When I arrived at Kivu and met the two men, they had only just finished putting their theory to the test. I found them radiant, overflowing with good spirits, but not very communicative when conversation touched the cause of this joy

they were so little able to hide. The truth was that they were expected to observe a strict silence by their distant director in Brussels, and it was not until much later that I was able to get the fascinating details from them. But that day, at Goma, I had to fall back on Bruno, the kindly black captain of their research ship. Bruno was amazed at what he had seen.

"We sent down five hundred yards of plastic tubing," he told me. "Then we pumped. Then we disconnected the pump. And the water kept on coming out of the tube by itself. . . . And it stank, sir, it stank!"

The negroes of the Congo, I've often noticed, are not highly sensitive to smells. If Bruno complained, it must have been powerfull It was the smell of rotten eggs, the characteristic effluvia of sulphuretted hydrogen.

"And they were so pleased," he went on, "that they gave themselves a shower with the stuff. . . . Using the pipe as hose, sir."

But it was several months before their director stopped treating them as crazy young Utopians, and came to recognize the value of the discovery. In this region the size of England, where mining and agricultural industries are being developed, the problem of energy has become acute. Planners of dams for hydro-electric plants come up against great difficulties of a geological nature; petrol has to be brought at great expense since the price for ocean freight is prohibitive; there is no coal, and wood for burning is rare. This unexpected source of energy, natural gas, was really providential. And what a source: a reservoir of two hundred and fifty square miles in surface area and eight hundred feet deep. The supply is practically inexhaustible, because, however often it is drawn off, a new methane formed by the decomposition of plankton dissolves in the deep layer to replace what has gone. Several power-houses placed round the two hundred and fifty to three hundred miles of lake shore should be able to operate from this source of energy.

A similar condition can scarcely be found except in a zone where this breaking-down process has taken place, for only there can the necessary circumstances come together: a sufficient depth of basin for the right degree of pressure at the

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bottom; the proximity of active volcanoes whose lavas and ashes enrich the deep waters as the mineral salts dissolve, so that these waters separate into two layers that the regular currents cannot mix; finally a wealth of organic matter whose putrefaction gives rise, among other products, to the combustible gas methane.

This discovery made me doubly happy: first for the sake of these very likeable men who had met with so many professional snubs and setbacks before the exceptional interest of their achievement was officially recognized, and then because it focused attention on these rift-valleys for which I had such a curious affection.

I was impatient to start, but before undertaking the long and formidable journey I intended to make a much-delayed visit to the crater of Nyiragongo, an active volcano whose powerful shape, some 6,500 feet high, towers over the village of Goma. I dreamt of descending to the bottom of its 13,000-foot well—a seething lake of incandescent lava. The thing seemed practicable, in spite of the great technical difficulties.

Unfortunately a circumstance that must be explained was going to expose us to the risk not only of various natural dangers but of legal ones, for we were going to contravene a certain set of very peculiar regulations.

There is really only one other place on earth where a similar phenomenon may be observed to-day—Hawaii, where the crater of Kilauea contains a burning lake of much the same kind as that of Nyiragongo. The Americans have had a volcanic observatory installed at Hawaii for more than thirty years. But in the Belgian Congo, the volcanoes have made the mistake of placing themselves in the bounds of a National Park. . . .

National Parks exist in many countries of the world and their directors generally show a liberal spirit in putting the aims of such institutions into practice: these are, preserving the flora, fauna, and the land itself; providing scientific investigators with the means of working in the best conditions; and giving to as large a public as possible every chance of knowing, loving and respecting nature. Alas, all these things may be encouraged in other places, but in the Belgian Congo the National Parks

are under the iron rule of a high functionary who seems to exist only to protect his treasures from every curious eye. Zoologists, geologists, or botanists, of such standing that they would be honoured guests in the most carefully-guarded sanctuary anywhere else on this earth, are here watched over at every step by native guards—admirably qualified, no doubt, to assess the needs of a research expedition.

It is not surprising in such circumstances to find that Nyiragongo, unlike Kilauea, is without anything at all resembling an observatory. Until 1948, when we managed to make the first descent—and drew on our heads, incidentally, the thunder of outraged authority—no one had any idea what was happening at the bottom of its crater. Even to-day, although our former expedition should already have proved that the thing was feasible, the volcano remains taboo, and there is no certainty about the exact nature of the lavas which seethe below. What is the point of knowing? Isn't the essential thing to own the place?

That first visit had left me with a deep desire to make a second journey down the gigantic cauldron. It was not only that I longed to watch it in action again, but I believed that we would be doing valuable work in collecting samples of the rock for analysis, as well as in taking a series of spectrograms of the lava in its molten state.

For there is a particularly interesting problem in this region. Two great volcanoes, Nyiragongo and Nyamulagira, are in activity, and this activity occurs sometimes simultaneously, sometimes alternately. Are they fed from the same source, or from different reservoirs? Do subterranean communications exist between the two gigantic cones? The study that I had made five years earlier of a satellite eruption of Nyamulagira had led me to believe that the two volcanoes were independent of each other. An analysis of their respective lavas ought to have confirmed this opinion. Unfortunately, though it had been easy enough to take away samples of fresh lava from Nyamulagira, it had been impossible, to say the least, to make an adequate descent down the crater of Nyiragongo. The basalts of Nyira are very different from those of Nyam; on the other hand, the lava of each separate volcano, whether old or recent, does not vary in kind. This would suggest that the deep reservoirs are unquestionably distinct. But the absence of any specimen of the

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lava now flowing from Nyiragongo makes it impossible for anyone to be certain, I could think of only one convincing way of proving absolutely that the two volcanoes rose from separate sources—by taking a sample of the lava which is still active in Nyiragongo, having it analysed, and comparing it with that of Nyamlagira.

The problem in itself was simple: I had to find porters to climb over the two miles of volcano leading to the crater mouth, to carry the equipment there, and to bring it back. That would appear to be all—at least, in any other country in the world. . . . Just at this moment I learnt that a volcanologist who had come here following a year's mission to the United States, to Hawaii and Japan, had obtained, after long and tedious negotiations, nothing more than permission to visit, *under surveillance*, the sleeping crater of Nyamlagira, and *no other volcano at all*—certainly not the only one in activity! I could see now that I would either have to abandon the whole idea, or to find a way of sliding under the iron curtain.

Our preparations were carefully worked out. We had procured four hundred yards of fine steel cable to carry our equipment to the crater's foot. Our gear, bedding and provisions were packed into linen bags, in loads of thirty-three pounds. We could not put any more in them, for the slope to climb was steep, and the natives of this region are not over strong.

One day my friend Bridget summoned me:

"I have here Kamusinzi, the old local chief. He has come to ask for medicine; but he has something to say about the volcanoes, if you can get him to talk."

The old man was sitting on the grass by the blue water of the lake, puffing at a short clay pipe that he held in the hollow of his palm. It is difficult to judge the age of these Africans, for their skin wrinkles early. This one, however, seemed to me unusually ancient, with his white goatee beard and white wiry hair that he revealed when he raised his worn felt hat to scratch his head. He continued to squat there in his brown cotton loin-cloth, his filmy eyes lost in a dream. Near to him, sitting on their heels, two young men also smoked their pipes in silence. All three stood out in profile against the astonishing azure of the lake which seemed to stretch away without limits, for the

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rains had been over for some weeks, and already the haze of the dry season, made of the finest dust, had blurred into nothingness everything more than a league or two away. There was no opposite shore; there were no mountains—only water and sky.

"Kamusinzi, tell us about the volcanoes," said Bridget "You believe that we cannot go there?"

He mused a moment longer, then murmured in his quavering voice:

"The fire mountains, they still belong to us."

He spoke in a mixture of Swahili and Kinyaruanda, which only Bridget could really understand.

"The white men forbid us to go there. But they cannot keep us from going there when we die."

"You go there when you die, Kamusinzi?"

"*Hooo*. . . *We* do, the black men, we go there when we are dead. Not the white men. The Banyaruanda and the Batutsi, they go into Nyiragongo, while the Bahunde, the Batokaidjwi, and the Bahavu, they go into Nyamlagira."

"And what do the dead do in the volcanoes, Kamusinzi?"

"They live. The men and the women. They live there for their chiefs."

"They still work for their chiefs, as they do here?"

"No, they do not till the fields, they do not fish, they do not hunt. But they are always obedient to their chiefs."

"And what do they eat, Kamusinzi?"

"*Wâpi!* (Come now!) Does a shadow eat? Does your own shadow eat, now, while you are alive? Get along with you!"

There seemed no lack of reason in this.

"And the fire in the volcano, Kamusinzi?"

"The fire? That is made by the *kinwâli*, the shadows, which have charge of the fire in the volcano. When the chief orders an eruption, they blow and their breath sets fire to the grass, the trees, the stones. . . ."

"So the eruptions are ordered by the chiefs who are dead?"

"Yes, sometimes, when something has annoyed them. Nugwambwa made a *great*" (he lingered on the word, drawing out the central *û*: *mukûbwa*) "eruption, already" (*zaniâni*: he insisted again on lengthening the syllable *â*). "He was furious because the Balioko had invaded the sacred places after his

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death. In order to obtain slaves there, they had set foot in his forbidden sanctuary. And also, to eat much."

"What, besides?"

"What besides? Every time a chief dies and goes into the volcano there is an eruption. And the greater the chief, the greater is the eruption."

"Who makes the great eruptions, Kamusinzi?"

"Nyamlagira, because he is the husband of Nyiragongo. Nyiragongo: that is the wife of Nyamlagira. Nyamlagira, that was a chief, a great chief, long, long ago' (*ṣaámáni, ṣaámáni kabisa!*) "and Nyiragongo, that was . . ."

He stopped abruptly, lost in a misty dream in which all his vanished power had come again.

Suddenly he began:

"It is we, the chiefs, who make the eruptions. When the wife of my brother Nazulu died there was a great eruption. It was when the *Ba-alema* were still with the Banyaruanda."

"The eruption of 1912," Bridget whispered to me, "that was Kateruzi. The *Ba-alema* are the Germans. And the eruption of 1938, Kamusinzi?"

"That was Mafume, son of Nyamulisi, of Moanga, of the tribe of the Washalimokoto."

"Was it he, Kamusinzi, who was buried in the wooded peninsula of Lake Mokoto?" asked Bridget.

"Yes, he was buried in a sacred peninsula where the chiefs of the Washalimokoto are buried."

"Is it true what they say, that nobody can set foot there?"

"Yes, it is true: a man who dared to venture within five paces of the edge would drown. It is the sacred peninsula."

"And the eruption of 1948?" I asked, in my turn.

"Two years ago," replied Kamusinzi, "that of Shové, that was the chief Bikahe, of Bwambali. That of Gituro, that was Kayembe, of Kishari. And the last, that was Kanyaruanda, of Tongo."¹

"But he was not dead at the moment of the eruption," remarked Bridget.

"That is why he did not go straight into the volcano," replied the old man. "He had to wander first."

¹ That of 1951. There has been a still more recent eruption at the beginning of 1954.

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"Tell me, Kamusinzi. Can one do anything to prevent an eruption?"

"*Wápi!* One can do nothing to prevent an eruption. But it can be stopped. Sacrifices must be made to the kinvali, and to the chief who is causing the eruption. Goats, cows, *pombé* (banana beer). . . . But when *I* die, there will be a terrible eruption! For I am a great chief, very old."

"Yes, you are old and wise," said Bridget. "How old are you?"

"Oh, I am old, old. . . . No one can know my age, so old am I!"

"Are you a hundred, Kamusinzi?"

"*Wápi!*" He was really outraged. "*Wápi!* A hundred. . . . I am *three* hundred!"

At that point the interview could only stop.

Chapter Fifteen

THE BURNING LAKE

THE ONLY POSSIBLE way to reach the top of Nyiragongo without difficulty is by the specially-prepared elephant track that visitors follow in the company of the park guards. This meant that our team, which numbered at least a dozen persons, including the porters, would have to avoid the guards' huts set up at the beginning of the track. The means of doing this were clearly revealed from the air: the park authorities had opened up a kind of long clearing which crossed first the motor road, then, farther on, the path to Nyiragongo.

As we hoped to descend not only as far as a kind of vast ring-shaped platform that we had reached in 1948, but also to the crater bottom itself with its lake of seething basalt, we had to have a sufficiently strong team to give support from the ridge. I wondered if we would find enough volunteers to brave—as well as the perils of the volcano—the no less formidable dangers of the National Park. To my surprise, all those that we sounded appeared full of enthusiasm. The Africans were, in fact, delighted at this chance to venture into their ancestral land where for so many years they have not been allowed to set foot. Finally, there were twenty-five of us to cram into the two vans—already full of bundles, tripods, and other equipment—which were to cover the thirty miles between our present position and the site.

The night was still completely black when we stopped: we had waited for the new moon to have all the possible chances on our side. One after another the boys jumped silently to the ground and melted into the bush. The unloading was hurriedly carried out; then, while our driver friends turned back, our own team started on the route without losing an instant. We had arranged that the vans should return to the same place at nine in the evening, each night from the second day onwards.

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Since we scarcely dared to use our pocket lamps at all for fear of attracting some guard suffering from insomnia, we kept going astray over this treacherously rugged ground, full of stones and holes concealed by grass. It was absolutely necessary to leave the open savannah and take cover in the forest before daybreak. A noise to the left disturbed us a little; all the file froze into stillness, and stood there motionless until one of the natives whispered: "*Tembo* (an elephant)!" But for us the wild animals were less of a menace than the guards. Cautiously, we resumed our journey and came to the branching of the path. A quarter of an hour later we were in the shelter of the trees. Shortly after this we saw the first gleam of the dawn.

The base of Nyiragongo is widely spread out on a stretch of rugged lava which slopes down to Lake Kivu in the south and to the game-stocked plains of the Rutshuru and the Ruindi in the north. Already we were at six thousand five hundred feet, having passed the initial obstacle of the guards without incident; from now on we felt certain of reaching the lip of the crater. We advanced in Indian file, following the path opened by the elephants in the thick dark forest. The humidity was such that the sphagnum and other mosses were soaked with water, and long sea-green lichenous growths hung from the branches like the hair of marine divinities. At the end of two hours the appearance of the forest changed. The leafy *Hagenia*, great *Podocarpus* smelling of resin, the fairly conventional-looking trees twined with creepers, were now succeeded by some extraordinary growths thirty or forty feet high, with narrow dark leaves and twisted trunks—the briar trees, giant briars with deep green foliage swinging in the breeze. We had entered a strange forest, very dark, very beautiful.

But soon there were a number of glades or clearings, and we could see in the distance, on the right, the majestic peak of Mikeno, an ancient volcano gnawed away by erosion, whose silhouette standing out against the light reminded me of the Matterhorn. After an abrupt rise where the porters had to make a particular effort, we reached a level area formed by the meeting of the slope of Nyiragongo with that of its powerful satellite (now extinct) Shاهرu. Soon, we were able to look into the filled-up crater. From where we were it seemed luminous, a

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marvellous light green plain. Actually it is nothing but a vast circular marsh half a mile in diameter.

On the other side, on its north flank, Nyiragongo has a still more important satellite, Baruta. These three cones which overlook the surrounding country from heights of three thousand to six thousand feet were born out of the same fracture of the earth's crust; but though the two outer furnaces are extinct, the central fire in the heart of Nyiragongo is burning still.

It was nearly eight o'clock when we emerged at last into a great horizontal clearing in which were two or three huts made of briar trunks roughly arranged in a pyramid—the "briar camp" where tourists sometimes spend the night in order to avoid the fatigue of a double journey, from the foot to the summit, in one day. We agreed to have a long rest at this point, a particularly welcome prospect since a number of us were not in training; some were out of breath, others had painful muscles. There was little to regret in the delay, for the weather was very dull and the top of the volcano was not to be seen at all.

We resumed our journey, making our way through a clearing. The wind chased the whitish scrolls along the sky, each ringed with streaks of miraculous blue. The peak of the mountain remained dissolved in the blur of grey smoke which was breathed out by the crater.

The briar forest rises to about ten thousand feet, then stops abruptly, giving place to a still stranger vegetation. Among the rising arborescent groundsel with its wide thick downy leaves, giant lobelias point their flowery stems like candles into the mist. Tufts of wiry, greyish grass still cling to any damp cracks in the rock, but soon the rock is bare, a blackish basalt which gradually, on the upper part of the slope, fills the whole landscape.

The convoy advanced at a regular pace in the very heart of the cloud. A muffled silence wreathed the world. The whole universe was reduced to the vague silhouette of those walking immediately ahead.

Moving along in this blind and halting way we were suddenly surprised to find ourselves at the end of the climb, brought to a halt by the brutally sharp descent of the crater-hole. To the left as to the right the narrow peak was lost in the

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mist; in front of us the wall plunged abruptly under our feet into the immaterial greyness which replaced the world we knew. One by one the men reached the summit; but before the last of them was there the first were already shivering in the icy damp.

While we waited for the mist to clear before beginning the descent we sought shelter from the gale just inside the crater's lip, about four or five yards down. Louis Tormoz and some of the Africans rapidly arranged a platform among the loose rocks, and there we pitched a tent to serve as our base camp. Then the cloud turned into a fine persistent drizzle. We crouched together under the canvas, numb with cold. All we could do was wait patiently—but it was not an inspiring occupation. The persistent bad weather had its compensation, however, for we were fairly certain of seeing neither tourists nor guards. For all that, no chances were taken; we had left two look-outs at the upper edge of the forest. If they gave a warning, the main part of our company were to retreat to left or right until the curve of the cone hid them from view, while two appointed men would take down the tent and hide in the crater itself, under an overhanging ledge that we had noted. If the alarm was given when a group of men were below, the operation would be the same for the men above, except that they would also have to try to keep the wire cable out of sight; as for those in the crater, so long as they refrained from moving and were far enough down, they would probably not be noticed at all.

We had to wait several hours. Meanwhile, the drizzle continued to fall. An African made a fire of briar branches and we concocted a stew—one of those "altitude mixtures" compounded of powdered soup, beef extract, flour, ham, cheese, and other treasures discovered in our haversacks.

Then, as if by a spell, the mists suddenly opened to reveal a pure blue sky. A few moments later the immense ring of the crater appeared under our eyes, a colossal cauldron whose sides sloped sharply down till they came to an end eight hundred feet below against the circular ledge of a vast horizontal platform. In the centre lay the living well, from which rose vertically a tall column of reddish smoke and clear steam whose whiteness cut into the brilliant blue of the sky. It was five years since I had

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seen this spectacle. At that time I was accustomed to it. Now, I was astonished at the freshness of my delight.

One of the porters exclaimed: "Look at the platform below. . . . It is like stone, not like lava. The devils have done this."

"It is the *kimwali*," said another, "so that they can dance there when no man is watching."

They gazed at it round-eyed, at once frightened and curious.

It was true; the surface of the inner platform was perfectly smooth in contrast to the rugged basalt which is the basic soil of the volcanic region of Lake Kivu. But it would have been no use to explain to our companions that all the hollows of the ledge nearly eight hundred feet under their feet had been filled in or worn away by the rains washing down the sides. They would have thought in their hearts: "These whites, they know nothing."

We had no time to lose; the afternoon was already well advanced. I fastened myself to the rope, tied the end of the steel cable—our baggage funicular—to my waist, and started on the descent. The idea was that I, knowing the way, would quickly go down alone so that the cable could be fixed without any delay, and the equipment and supplies for the team below could be brought down before nightfall. This team would go down as soon as the cable was working.

There is only one practicable way down. It is easy enough at the start: a kind of wide couloir scattered with large crumbling stones. After about fifty yards the slope becomes sharper; a vertical rocky bar (fortunately provided with quantities of excellent holes) has to be crossed, and one arrives at the first of the thick strata of volcanic tuff or debris which lies between the layers of hard rock. This wall reveals clearly the volcano's internal structure, showing how the mountain was built up century after century by alternate deposits of lava flow and ashes, of grit and pebbles, which sank down and accumulated to form what is called volcanic tuff.¹ Following these gaseous eruptions, effusions of liquid lava flow like water over the slopes, covering the ashes of the earlier eruption and solidifying into a firm though porous rock. This alternating of two types of eruption,

¹ Not to be confused with calcareous *nsa*, a chalky sub-soil formed by precipitation and compression of the carbonate of lime in the waters.

so that rocks and ashes are interleaved, resulted at last in the creation of this powerful cone, this strato-volcano, with its funnel-shaped crater at the summit. Then, when the growing period was over, the activity of Nyiragongo decreased and the level of the column of lava under the mountain gradually sank, leaving a void into which one fine day the centre of the cone suddenly disappeared. It had become a kind of giant cauldron, whose almost vertical lining I was now about to descend.

It was not difficult to cross the beds of reddish tuff, but it did require unusual caution. No hold is to be trusted; the smallest like the largest may at the least disturbance detach themselves from the surrounding mass of ashes.

Presently an overhang of crumbling rock made me take a horizontal crossing, and from that moment the rope and the steel cable began to give me trouble. They were no longer following a straight line between my comrades and myself, and in their zigzags they had an annoying tendency to catch in the innumerable loose stones and send them hurtling below. Presently, a second problem was added to the first—the friction on the rope. This trouble could only increase, and I had continually to swing the cord and cable over the prominent rocks. In certain vertical passages these strenuous gymnastics were not exactly convenient, and when I was three-quarters of the way down the cable became inextricably wedged. Ten minutes of shaking, pulling, twisting, were of no avail at all, and my cries and shouts for someone above to wave the rope no longer reached my fellow explorers. I therefore unfastened myself and fixed the end of the steel cable to a jutting stone, leaving to Tormoz the task of unfastening this ill-fated wire and bringing it to the bottom. Then I continued the descent.

I arrived at last on a cone of debris which lay heaped against the wall just there (though I damaged it somewhat by leaping from rock to rock), and reached the horizontal platform. At that precise moment the clouds flying before the east wind enveloped my universe once again; in a few seconds I could see no further than a yard or two. There was nothing to do but crouch there and fume with impatience.

The time was passing, and I began to fear that it would be nightfall before there was a break in the mist. If this were the case my companions would find it impossible to make a descent

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before the next day, and I—besides the major vexation of lack of working equipment—would have the discomfort of a night without warm clothing or food. This, indeed, was what actually happened. At six o'clock darkness fell, though the mist still glowed a dull scarlet from the reflection of the lava at the bottom of the central well. I had no hope now of company, food or drink. My teeth chattered; I was damp through and through.

I do not know how long this state of waiting lasted. But at last, after several hours, the sky began to clear. Over my head a perfectly formed circle pierced with stars revealed itself; some fifty yards down I could see a bloody wound in the blackness of the night, the opening of the central well. A powerful column of swirling smoke came out of it, tinged a dramatic crimson colour by the fire below. With the help of this reflection I rapidly reached the lip of the inner crater.

However much one may have seen of active volcanoes, it is always a shock to be faced with a great mass of lava in fusion. A few hundred yards under my gaze stretched a wide crescent-shaped lake, made of the primordial matter which, under the superficial crust of rocks, forms our planet. There lay the source of the glow which by night illuminates the sky of the whole region—fed endlessly by who knows what deeply-buried furnace.

The crescent, like a moon in partial eclipse, occupied the south-west corner of the well. Its convex edge stopped at the absolutely vertical wall, while the concave side lay under a gigantic stairway of tumbled cliff which filled up all the rest of the crater—if crater is the right word, for this second well is formed in the same way as the outer sink-hole in which it lies. These cliffs, ranged in tiers in the depths of the well, but now broken and cracked, were the remains of the great mass which was engulfed below. The structure of one pit within another is quite familiar in this type of volcano: there are examples, notably at Hawaii, in which there are no less than three cauldrons, one inside the next.

The lake of lava was about four hundred yards long by nearly a hundred yards at its middle. If the width seemed not to have changed, the length was clearly greater than when we had seen it five years earlier. The level had also risen several yards. Such variations of depth and of area appear to be an

accepted peculiarity of these lakes. Fifty years ago this crater had no lake of fire, and the central well was doubled into a figure eight, as a photograph taken from the upper crest by the first explorers clearly shows. Twenty years later a new caving in had given the well a trefoil shape, and it was not until the lava had risen from the depths and swallowed up the sharp projections in its boiling bath that the gulf assumed its present circular form.

At the moment when I reached the edge of the well, the lake was temporarily quiet. A thick black skin covered the incandescent liquid mass which could just be perceived underneath through a network of long narrow cracks. But in three or four places the violent boiling below prevented the skin from forming, and the fiercely burning lava which showed through had a colour as yellow as gold. Soon these jets became more vigorous; their diameter increased until they were more than twelve or fifteen yards across; the seething liquid spurted higher and higher, and fell back as enormous drops of molten metal into the vortex. The fountains became more and more violent; they sucked in the surrounding matter. Great pieces of crust detached themselves from the strange black floc and began to sail first slowly, then increasingly quickly, towards the fiery maelstroms in whose red fury they were swallowed up and vanished.

Sometimes everything was quiet; there was an unwonted silence, and only the purple fissures revealed the fearful substance of the lake. At other moments, a kind of rage seized the infernal cauldron; in a few moments the entire surface was in motion, the skin was scattered, the lake began to effervesce and boil and soon it resembled nothing so much as an immense explosion endlessly renewed. Then, to the chopping and splashing of waves of lava, to the whistling of the burning gas escaping through a series of vents in the extended horns of the crescent, was added the din of this new convulsion: explosions, shrieks, harsh groanings cutting roughly across the tremendous roar of the cataract. What was happening was that enormous blocks of cliff, undermined from below, eaten away by the corroding waves and the thousand-degree heat of the magma, were tumbling down with a crashing roar into the measureless furnace below. I wondered how it was that the whole mountain

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had not been swallowed up, how it managed to contain so much power without bursting into fragments.

I knew that where I was lying there was little real danger, but for all that a feeling of terror began to grip hold of me, and I had to make a determined effort not to give in, to convince myself that it was merely a case of extreme solitude working on the nerves. Even so, the place was impressive enough to terrify anyone, since all around the central well the platform itself was split into wide and deep crevasses, enormous pieces, disturbingly suspended over the void. But I had no choice of position: to witness the extraordinary spectacle you had to risk yourself on these peaks which hung over nothingness. Actually, they were much less fragile than I feared, for on the extreme edge of one of them, only a few paces away from me, stood still intact the cairn that we had erected there five years before. If that ill-balanced heap of stones had remained so long exactly where we had left it, it was hardly likely that it would choose this particular day to collapse.

The lake of fire was much more unpredictable in its behaviour than a similar piece of water, for not only did it produce these extraordinary noises, these alternating periods of calm and frenzy, but also continual currents rising suddenly out of the heart of the heavy liquid, moving slowly first, then more and more rapidly, and dragging along, now in one direction, now in another, the strange substance on which the black fragments of the broken skin were floating. It was rarely, however, that these currents swept the entire surface: most frequently, after having described a fairly emphatic curve, they moved towards the shore and disappeared beneath the black hard basalt of the overhanging edge in a flash of burning gold; while from all directions the lava leapt towards this fountain as if some subterranean plug beneath had been withdrawn. It happened that two or three fountains simultaneously attracted in that way a streak of the surrounding magma nearly a hundred yards long. The speed of the flow went on increasing until it reached its maximum, while the surface temperature must have passed eleven hundred degrees, to judge from the intense and brilliant yellow of the crucible.

Suddenly, everything grew calm. The currents slowed down

till they were hardly perceptible, then stopped; the dazzling gold changed to cherry red, to garnet, then to deep purple before being extinguished in a few seconds in the black of the newly-formed plastic skin. A period of repose set in, which might last for a few moments or for more than half an hour. Usually, however, one or two little fountains would awake, throwing up their scarlet plumes into the vast dark crater. During these quiescent times I could scarcely distinguish the smoke which rose from the depths; but during the periods of convulsion the vapours became so intensely red that a spectator as near as I was could watch all the demoniac dances of the sulphurous pool. I understood now why Nyiragongo, seen from the little town of Goma or even, on clear nights, from Bukavu (more than sixty miles as the crow flies), could sometimes light up the whole sky, while at others it appeared extinct.

The end of any period of calm was marked, usually, by a slow renewal of movement, but it was almost imperceptible, indicated only by a network of fine cracks over the surface. At first it had seemed to me that the principal current always came out from underneath an arch at the extreme eastern point of the crescent. But I later perceived that the current of lava could also flow in the opposite direction and pour into the tunnel at the end of the crescent's horn—a tunnel revealed by three enormous vents in the arch. Through these apertures, when they were not hidden by vapour, I could see the burning torrent which seemed now to draw, now to push back the molten basalt.

I bitterly regretted my lack of foresight, for the photographic colour film was left above with the other equipment. Down below I had nothing but a note-book and a Leica with an ordinary black and white roll. "If we spend another night here . . ." so ran my thoughts. But who could tell if a band of visitors might not arrive to spoil our plans next day?

I passed some hours lying there, my face scorched by the heat from the crater, my back and feet numbed with the icy damp of the night. The red glowed so strongly on the pages of my note-book that I could set down my observations without difficulty. But towards three o'clock in the morning my head felt heavy with sleep, and I dropped off for a moment during one of the times when the volcano was quiescent. It was the

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brutal contact of my chin against the sharp edge of the crater that woke me.

Not even a corner to sleep in! I struggled to my feet to look for some friendlier resting-place. My body ached all over, and I was hungry and thirsty as well. There may have been nothing to eat, but I did find a little water from last night's rain in the hollows of the great prismatic blocks fallen from the wall. The water had a slight taste of sulphur, but it was still drinkable. Unfortunately the little hollows were so shallow that as well as water I was swallowing volcanic ash which, indeed, covered everything. These fragments of lava, sharp and gritty, were all that I had to bite on during the night.

Now I was shivering. I decided to stretch out over one of the vapour jets which rose up here and there through the long cracks in the rock. I selected one which was escaping from a narrow fissure only four or five inches long, and lay down over it. The steam bathed my back and limbs with heat, and I relaxed on this bed of rock as if on the softest of couches. I even slept.

It was not for long. A gust of wind brusquely swept aside the warm vapour and pierced me with darts which were all the more icy since I was saturated with moisture from the steam. Then the wind died down and the gentle heat enveloped me anew, sending me back to sleep, until a sharp gust brought me once again to the harsh realities of my lot. When a little later the mist closed in, thick and total, cutting me off from the last link with a familiar world—the stars in the heavens—the long vigil seemed to me too intolerable to be endured. The hours dragged on in this alternation of humid warmth and freezing damp. At last, the darkness gave place to a colourless dawn.

Even now, the time passed slowly, as if it were sullenly hostile to its guest. Stretched out on my steamy crack I gazed at the greyish cotton-wool which had blotted out the world. I could not hope for help; it would be impossible for my companions to try the descent so long as visibility was nil. Sometimes the wind changed, driving the sharp sulphurous smoke in my direction, and I felt then more grotesquely out of my element than ever, a poor lost creature, shivering, coughing, weeping, seated on a crack of rock in the heart of the mist!

It must have been nine in the morning when something

startled me: people were talking just above my head. Logically, the thing was impossible; voices could hardly be heard even when we were shrieking up or down with all our might during a lull in the wind. I listened with all my ears, not daring to call out, then I heard another significant noise: the fall of stones. It proved beyond any doubt that climbers were making their way down the well. I was dumbfounded yet profoundly moved by the sound: the boys were taking the enormous risk of venturing down an unknown crater in the thick of this London fog. I stood up and hailed them. The welcome voice of Tormoz replied:

"Hullo! I can't see a thing!"

Judging from the direction of the cry they must have already gone half the distance. But another long hour was still needed before they could reach the bottom and join me. Then—there indeed was Louis, roped to Léon Berger, an Oberland Swiss who had become a planter in this region. Both carried heavy rucksacks, from which they took out dry clothes, a pneumatic mattress, a sleeping bag, a thermos, and packets of food.

I felt embarrassed: I would have so much liked to show them my overwhelming gratitude, but what could I say, beyond common thanks, however cordial. And yet . . . This descent, not only by a way which was unknown to them but in conditions which made them practically blind, on a precarious path surrounded by the most dangerous pitfalls, was one of those legendary feats that, in the Alps, only the most experienced rescue teams can hope to accomplish.

But how good it was to be lying down dry and warm, to have bread to eat, and cheese!

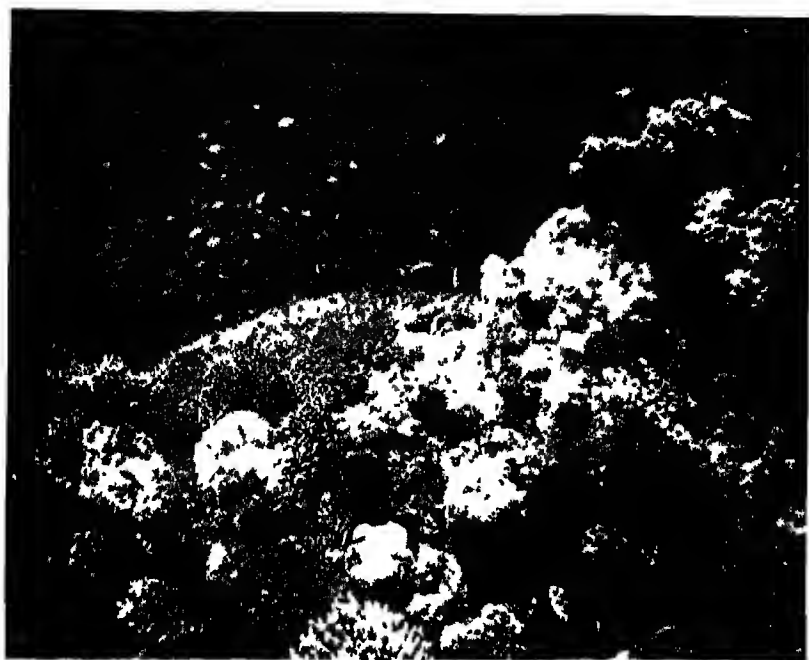
"We must go back," said Louis. "Now that I know the way we can do it quickly. As soon as the weather improves we can free the cable and carry on."

We had to wait until the afternoon for the mist to clear. Then, three of us roped together went down again, disentangled the cable, and took the end to the bottom. A little later the first bale of equipment came down to us. Soon the tent was erected between enormous pieces of fallen rock, which would protect it from sudden furious squalls that blew from time to time. The apparatus was prepared, and while we waited for the



5. *Captain Cousteau comes ashore on Abu-Lat*
We pitched the tents about a dozen yards from the shore





6. *Clouds of little rainbow-coloured fish*

He does not swim, but gently flies



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wreathing mist and smoke in the central well to disperse, we pierced the crust, chipped off samples of the rocky wall, and otherwise busied ourselves. We still had time to take a number of photographs of various aspects of the crater.

A little before dark the weather cleared at last. We hurried to the edge of the gulf. Some wreaths of mist were still swirling about; but suddenly they melted away and I felt quite ridiculously proud of *my* volcano as I watched its effect on my astonished and admiring friends. By daylight the red of the lava was less startling than in the darkness; on the other hand, extraordinary colours now appeared on the surface; the tops of the high fountains of lava were a dazzling orange; the film which had rapidly formed as the lake became still shimmered in violet, mauve and blue. Through binoculars we could see this skin trembling and breathing like a living thing, with the convulsive movements that always heralded a renewal of activity.

Night fell—more quickly here than in the world outside. An hour before midnight, after we had dealt with our photographing, our spectrograms, our notes, and other such practical business, we set off to explore in the clear night air. The surface of the platform soon became chaotically rough; more than once I wrenched my ankle in the stones.

We had to advance cautiously between the crevasses and the tumbled blocks from the wall. Out of the ground from time to time rose jets of steam, whitish evanescent ghosts. To the left, the well made a scarlet wound in the darkness under our feet; and the vast wall of the sink-hole, lit by the reflection of the lava, glowed vaguely red beneath the starry sky. We had made an almost complete tour of the well, avoiding only the zone where the thick fumes made it impossible to see anything, as well as difficult to breathe. In the course of this journey I perceived that the tunnel which prolonged the eastern end of the crescent went completely round the well and rejoined the other horn at the west. It seems therefore that the flow of lava, which sometimes entered and sometimes left the lake by the eastern horn, did not lead to unknown reservoirs but returned to the lake by way of the tunnel. The origin of these currents is still rather mysterious. The only place in the world where a similar phenomenon might have been observed up to now is the volcano Kilauea. According to one theory, it is caused by the

feeding of fresh lava through a vent or chimney linking the lake with the gulfs below. As soon as it appears in the crater, the new material, rich in gas and therefore relatively light, spreads over the surface of the lake, while the dense part, which has lost its gas in the atmosphere, sinks into the depths.

This theory, however, does not account for the two-way flowing of the current. What is more, the observations made at Hawaii during the past forty years seem to prove that the magma becomes really liquid only in the final feet of its ascent, when the pressure it supports is hardly greater than that of a few atmospheres. This would weaken the earlier theory: how in fact could the liquefied lava fall back and become part of the thicker magma below?

Another hypothesis is that this would produce a supply not of fresh lava but of heat alone, perhaps of warm gases rising from the deep regions which would allow the basalt to remain in a molten state. There is moreover another important source of calories which could supply the lake—the solidified and oxidized rocks which encircle it. Frequently they break off and fall into the cauldron, bringing with them an important quantity of air; this, with the oxygen in the rocks, sets up chemical reactions with the lava gas which release sufficient heat to keep the basalt in fusion. The currents, according to this theory, would be set in motion by local variations in temperature—themselves the result of these exothermic reactions. As for the “fountains”, these are explained by the appearance at the surface of pockets of virgin lava, rich in gas and very light. The fact that the most important fountains hardly ever change position seems to confirm this view, that the boiling pools are formed over the channels of supply.

We stayed watching the dazzling lake until we realized suddenly how exhausted we were. Stumbling over the treacherously uneven ground we returned to the camp where, with a little effort, four of us managed to cram into the little tent designed for two. The lack of space made up for the want of covering.

The light hours of the next day were spent in studying the base of the crater and in considering the possibility of making a real descent. Unfortunately we were obliged—at least for the time being—to give up any such hope. It would have needed

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either special equipment or more men than we had available to station on the platform where we now were; their task would have been to haul up the man or men returning from below for the last fifty yards of the ascent. For these fifty yards were not only vertical but overhung by a ledge.

A graver problem than the lack of assistance was official discouragement—otherwise, in spite of all risks, we might even now have ventured on a journey of such considerable scientific interest. The presence of a top-ranking climber like Tormoz, who had made several of the major Alpine ascents, made it possible to consider the scaling by two men roped together of the fifty or eighty vertical yards which followed the initial overhang. And the fact of being two at the bottom would have greatly increased our security while exploring the inferno; one of the pair could remain in comparative shelter ready to bring help to the other. It was already wonderful luck that three days should have passed without an alarm, and we almost blessed the persistent bad weather. But to try the supreme descent, two or three more days would have been necessary in order to bring down some of the strongest men still remaining on top, and to instal the gear we needed for hoisting. Now if there were an unwelcome visitation it was easy enough to scatter and take cover at the top, but it would have been impossible—above all when the cable had been fixed—for a sizable group at the base to disappear.

And so with heavy hearts we cast a final glance at the seething mass whose exact nature still remained a mystery, and turned our backs on the prodigious well. I hoped, however, that the analysis of the "Pélé's hair" that we had patiently collected would throw some light on its composition, and perhaps confirm certain theories about the origin and distribution of the magma in this region. "Pélé's hair" is the name given to the fine filaments, drawn out like glass, which the wind carries away from the foaming crests of the fountains. We had managed to gather up a small quantity of these fragile threads, the only sample of the actual lava of Nyiragongo that we were able to bring back.

We struck camp in the returning mist, sent up the last bundles, unhooked the cable and made our way to the summit.

Chapter Sixteen

ELEPHANTS

WE NEEDED TO hurry if we were to get outside the forest before night. In the icy gale which swept the summit and which our men had been enduring for three days, we packed the bags, rolled up cords and cables, and each took a load. The Indian file was formed again and cautiously started down the outer slope of the volcano in the mist.

We emerged from the cloud a little before the briar forest began. It was already past four o'clock, and so it was at a fairly rapid pace that we set off down the mountain-side to the accompaniment of stumbles, falls and muttered oaths. Our Africans were so terrified of the elephants which live in great numbers on the wooded flanks of Nyira that they were absolutely determined to get under cover before night. As for us, the idea of a hot bath was like a dream of paradise.

Where the briars came to an end we found ourselves in the forest proper again. A herd of elephants had followed the track since our climb; we realized this by the impressive heaps of manure whose smell recalled the peaceful stable of a French farm. In two places the animals had halted to feed or play, and there the ground was trampled flat—the trees crushed as if by a power-hammer. When you see tree-trunks a yard in circumference broken like matchsticks, the vegetation reduced to a mash; when you gaze at circular imprints of feet the size of enormous dinner plates, when you compare the devastation with your recollection of the same patch of jungle only three days ago when it appeared so impenetrably thick, it is difficult not to feel at least a slight apprehension. You glance at your watch; you calculate that there are at least three-quarters of an hour before you can leave the place though night must fall in thirty-five minutes—and you try to go a little faster.

The evening brought out the forest scents. In one zone

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bunches of orange flowers on a fair-sized tree spread out a fetid odour of unwashed feet; another zone was filled with the delicious perfume of apple or pineapple.

In spite of all our haste we were still in the forest when night fell. As best we could, we hastened along the muddy path. It was long since anyone had uttered a word—the sound of voices would have carried as far as the guards. We might have been under the earth, so thick was the forest over our heads; we could not even see the man who walked in front, though he was near enough to touch or stumble against.

Suddenly the air was torn by a deafening trumpet blast. I stopped short without quite knowing why, and Bridget who was following me crashed into my back. When a second blast rang out I understood what was happening; at the same time I heard the porters shouting as they ran:

"Tembo! Tembo! Elephants!"

The noise of the angry elephants was terrifying, and in the thick darkness where it had surprised us its power was increased. There was an instant of panic during which each man fled where he could. There was no more question of the jungle being impenetrable! Blacks and whites alike, we leapt through the incredible web of creepers, brambles, of erect or fallen trunks, heedless of the cruel scratches, knocks or bruises, anxious only to find some miraculous place to hide.

I do not know what distance we covered in this way. I remember only that I tripped up for the last time; my foot caught in a creeper and I made no attempt to get up. I panted, my face against the earth . . . fifty yards, a hundred? It was a marvel that I could have got through that tangle of vegetation at all; and as I thought this, calm returned to me. I called in a low voice: "Bridget?"

"Hallo, Kim!" I heard her not far away, and breathless. "Where are you? Have you got the lamp?"

"Yes, here." I felt in my pocket and pressed the knob of the electric torch, masking the light with my hand. A few yards away I saw the silhouettes of Bridget and two porters. I rose to my feet and went where they were standing.

"Did you see them?"

"No, but they can't be far, to judge from the noise. Mali-

sole," Bridget continued in Swahili, turning to one of the natives, "did you see the *tembo*?"

"*Hapana* (no), M'dami," breathed the man. Even in these two words I could sense his trembling.

"I saw them." It was a third porter who had silently joined us, guided by the glimmer of the torch. "Bwana Louis had his lamp, and I saw the *tembo*. Very near, M'dami. . . ."

"How many were there, Barakiro?"

"One, very very close. And then, there was behind him . . ."

"Bwana Louis and the others—where are they?"

We huddled there, head against head, conspiring in low voices so that we should not attract the attention of the giant lords of this forest.

"They ran on ahead."

"They got through before the elephant came on to the path?"

"Yes, M'dami."

He said yes, but was it certain? The whole thing had taken place in a few seconds, then panic had seized us. Still terrified, the Africans were clustering round us like children. What could we have done for them if we had been attacked at that moment? Even with a good rifle, I would not care to encounter an elephant at night. Suddenly I heard the sound of branches breaking behind me and I started violently. The light of the torch revealed, however, not the dreaded *tembo*, but one of our porters who had come back when he heard us talking. Phew! Two others crept up, then two more.

"From what they say," whispered Bridget, "Louis and two porters managed to pass under the elephants' very nose. Malisele claims to have received a blow from a trunk."

"More likely he knocked against a creeper. You don't imagine, Bridget, that if he had been within reach of a furious elephant's trunk he could have escaped?"

"Mm . . . you never know with these beasts—nor with the Africans. But I am worried about Louis. The others at the head should have had enough of a start." Then, addressing herself to the porters:

"Malisele, Barakiro! You are certain that Bwana Louis ran ahead?"

"Yes, he ran ahead, M'dami."

There was not much conviction in the tone. Was it uncer-

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tainty that altered their voices, or was it fear? I took a chance, and called out softly: "Hi, Louis!"

Silent, attentive, we listened to the silent night.

"Louis . . . Looouis . . ."

Evidently, if they had been able to get ahead of the elephants, they must now be outside the reach of our voices. Unless . . . But we dared not voice our thoughts.

"Come on, we must try to get back to the path."

Seeing that we were moving, though not without caution, towards the place from which we had fled only a few minutes earlier, the Africans showed a strong disinclination to move.

"Come on. Don't act like women!" came Bridget's energetic whisper. "Follow us."

This appeal to their masculine pride—usually most effective—appeared for once to have little effect. But when the porters realized that we would simply leave them on their own, they preferred facing a rush of elephants in our company to staying alone in the forest like lost children. In single file, bending down cautiously, we advanced step by step. Soon we reached the path and made our way more carefully still. From time to time I pressed the knob of the torch, allowing only a narrow gleam of reddish light to filter between my closed fingers. Once we stopped to call Louis in a low voice. There was no answer. And suddenly there was another mad flight. No more than two yards away, it seemed, a trumpeting sounded—yet there had been no other warning of the dark mass which stood on the path preventing all passage.

We managed to reassemble ourselves about a hundred yards away, and for a long time discussed plans in a low voice. What should we do? Sleep where we were? Wait till the great beasts had gone away before resuming our journey? Skirt round the danger zone by going deeper into the jungle? Bridget and some of the natives were of the last opinion. But it had little attraction for me. I feared the difficulty of the march through the virgin forest, the traps that night would add to those of a lava ground full of holes, of bogs and hollows masked by thorn bushes and sharp-edged rocks. What was more, since the natives had jettisoned all the baggage in their flight, we no longer possessed even a *panga* (a cutlass). And God knew how far we still were from the edge of the forest. In my

state of fatigue I would have preferred to sit down under a tree and wait till the way was clear.

I told them of one of my past experiences. Several years earlier I had found myself face to face with a solitary old elephant in the forest that grows about Nyamlagira. Some moments before I had been explaining learnedly to my companion that with wild animals one must never show fear. Putting this axiom into practice I requested the elephant to give way to us. It evidently understood neither French nor Swahili. I then tried to insult the creature, but it took no notice. Faced with this impassivity, I turned round to my companion and whispered: "You'll see!" and advanced towards the elephant expressing in voice and manner that I was extremely vexed. That at least had an effect: the great creature came briskly out of its trance, flapped its vast ears, raised its trunk and . . . we did not see what followed, since, so long as we had any breath, we did not stop to look round!

Now we had a similar problem: what were we to do about it?

The council of war went on. Some of the Africans were terrified at the idea of remaining so near to the herd; others seemed more affected by the dangers of making our way through the forest. Once or twice, hoping that the path would be clear, I stole along towards the critical spot. But there was no reason why we should *annoy* the elephant. Thirty yards away we could hear the rumbling of mighty bowels, and in the strained silence of the night these harmless gurgling noises froze us as much as the creature's roars of rage. Several times, in subdued voices, we hailed Louis anew, but always without result.

"Besides," I said, "I don't want to abandon the loads. Not so much because of the elephants; they'll crush anything in their way in any case. But because of the guards, to-morrow. The film, the specimens. . . ."

"Don't bother about that, Kim," replied Bridget, in her resolute voice, "we'll come back before dawn."

Brrr! I shivered at the idea of getting up at four in the morning. Of course we had little chance of getting to bed anyhow that night. But when Malisele, who certainly knew nothing about it, declared to me that we were now barely five hundred

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yards from the edge of the forest, I finally came round to Bridget's plan. We tied our handkerchiefs to some branches so that we could find the place the next day and, bending double, started out into the jungle.

We had put one of the Africans at the head to serve as pilot. First he made us go down to the bottom of a thickly-wooded ravine. Judging that we were far enough by now from the herd which had put us to flight I passed the torch to our guide to help him to find the most likely way through. Was it because of this? A few moments later we heard—though still far away—the elephants' trumpeting starting up again. We put out the light and continued in the terrifying dark. Soon, however, the sky cleared, stars pierced the night, and our progress was much easier. I threw a glance at the constellations and was about to continue on the heels of my companions when I realized that something was wrong. I stopped and looked up again: there was no doubt about it, we were making for the north-east, turning our backs on the still-distant road where the van was supposed to be meeting us! I was reminded not for the first time, how easily these Africans could lose their sense of direction when they are in an unfamiliar region. It is their prodigious memory which enables them to find their way in the thickest forest if they have been through it before, however featureless the place may appear to our European eyes. But on new ground I prefer to trust myself to the sun, the stars and a compass.

Malisele was not so far out in estimating distances: once we had changed direction it was hardly more than an hour before we saw the trees in front of us suddenly thinning out. We emerged into the grassy plain which spread out in the distance under the abundant light of the stars. Behind us, over the forest, the plummy smoke of Nyiragongo glowed faintly. Evidently its lake of lava was quiescent.

We now felt safe enough to walk without bending down, and could even see some yards about us. We advanced boldly, and as we went we called the names of our companions at the tops of our voices. But we must have been a long way out of their path, for there were no replies.

"Listen, Bridget, if there had been an accident we should have heard them call out. A man isn't killed by an elephant

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without having time to make a noise. Besides, there are *four* men, remember. . . .”

But her anxiety was not set at rest for another hour, when we found our friends at last. Before rejoining them, however, we had a few excitements still to come: a leopard gliding through the tall grass and, on a rise in the ground further off, two elephants whose motionless silhouettes stood out against the dark blue sky.

There is practically no danger in meeting an elephant in the grassy plains, but outside the national parks and the game reserves this happens more and more rarely, since intensive hunting has forced it back into the thickest part of the forest. In these fastnesses a meeting is considerably more dangerous, partly because one usually stumbles on the creature accidentally, and so frightens it; but partly too because it has learnt to look on man as an enemy.

In the opinion of the most experienced professional hunters the elephant does not attack without provocation, whether real, such as a wound from a rifle shot, or imaginary, such as being encountered unawares. An earlier provocation can, moreover, be held against you; an elephant escaped from a hunt, or, what is worse, recovered from a wound, provides one of the most dismaying encounters that it is possible to make in the undergrowth. That is why, when you walk in the forest and suspect that elephants are in the neighbourhood you do better not to be too quiet, to give them a chance of moving away.

If the creature is not particularly irritated, it usually allows a man to approach as near as twenty or thirty yards. If you try to come any closer it can react in two ways. One is to make a calm departure, with its heavy yet limber and easy tread. The other is to charge. It is unusual, however, for this charge to be dangerous. Except in the case of an ill-tempered stray, of a mother concerned for its calf, or of a beast escaped from a former hunt, all of which will pursue their attack to the end, the “average” elephant merely makes a feint, just sufficient to put the intruders to flight. A police charge, it has been called by one of my old friends who has known the elephant for a quarter of a century.

In the morning which followed this eventful and emotional

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night Bridget and Louis went over the ground to look for the abandoned gear. The tracks they came upon showed that we had surprised a herd while feeding; it included very young calves whose little feet had made light imprints among the enormous hollows, some two feet wide, left by the old male. It was this last which, to protect its young no doubt, had carried out a "police charge" and afterwards had stayed on guard in the middle of the track.

Chapter Seventeen

CROCODILES

ANOTHER CREATURE IN Africa is held to be very dangerous—the crocodile. In the jaws of these monsters which swarm in nearly every stream or lake, thousands of people lose their lives every year. Crocodiles have a dreadful reputation for ferocity. However, if these reptiles do dispose of a great many people, they are at the same time essentially cowardly, and do not deserve in any way to be compared with the courageous jungle beasts. I have observed their cowardice myself.

Crocodiles aroused an extreme repulsion in me, as in everyone else, and I always behaved with excessive caution near the infested waters. But the transparent waters of Lake Tanganyika made me realize that we knew practically nothing of the sub-aquatic ways of these creatures, and that it would be interesting to observe them in their own milieu. The chances were that under the surface they would behave like sharks, which, as we had remarked during the voyage of the *Calypso*, never attacked the diver who was completely under water. Why shouldn't the crocodiles of Tanganyika have a similar reaction? I decided to try the experiment, and cabled my wife to send me a diving outfit. But there is a long distance between Europe and the heart of Africa, and before the outfit arrived my fine assurance of the harmlessness of the great saurians had been shaken by the horrified prognostications of all to whom I mentioned my idea. My own imagination went to work as well; I began to think more and more seriously of how to defend myself. After many hesitations I decided on what seemed the complete security offered by a metal cage. I made a diagram, and some immigrant Italian workmen recently come from Ethiopia built it in a few days. It was a cylinder three feet in diameter and six feet long with bars a third of an inch thick and twenty centimetres apart. I could remain there comfortably lying at full length,

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flippers on my feet and a camera in my hand. The entrance was by a door closed with a metal latch, the idea being to prevent the crocodile from coming inside to keep the diver company.

To stop the cage from sinking, floats had been fixed to it in such a way that the total density was always that of the water. That at least was the idea, but at the trials our submarine dived without hesitation towards the bottom. Fortunately this possibility had been foreseen, and four of us were at hand to hold it back with ropes. After a number of experiments the unequal balance was righted by adding jerrycans half full of water. The cage could be dismantled in three parts, one fitting into another, which made transport a fairly simple matter. And so one day, eventually, we loaded the land rover and started on a journey of five hundred miles. Louis Tormoz and Malisele came with me. Our aim was the village of M'toa, on the western shores of Lake Tanganyika. It was in that stretch of limpid water, Capart had told me, that I would find the greatest number of crocodiles. I knew that if Capart advised M'toa it was worth the trouble to go to M'toa.

We reached there after a day of jolts and bumps and racketing. The country along the western edge of the *graben* was magnificent: abrupt mountains rising to some thousands of feet and covered with fresh green forests and grassy stretches overlook the blue lake. From the cool heights of Kivu you go down first into the plain of the lower Ruzizi, hot, and teeming with game which feeds in the tall spurge-like grass. Not far from the mouth of the Ruzizi you reach the northern extremity of Tanganyika, which you skirt thereafter by an admirable coast road, a sort of ledge cut in the rocks, scarcely a few feet above the crystalline water. Then the road leaves the shore to travel over several mountain ranges, and you do not see the sapphire of the lake again until, another one hundred and eighty miles to the south, you emerge near Albertville, the chief town of the district. Here, as nearly everywhere under white influence, the natural beauty of the landscape is ravaged by buildings of an inexcusable hideousness.

M'toa lies an hour's journey by car to the north of Albertville. It is a typical local village, though unusually well kept, its thatch-covered clay huts and houses arranged over a long rectangle of beaten earth under great mango trees with luxurious

and massive foliage. Fowls cackle, women are busy about their household work. The children, chubby and dirty, are adorable.

Eventually I found the chief who promised me for the next day a large canoe and ten or a dozen men to paddle it. We continued as far as the bank, a thousand yards ahead. The tent was pitched on the golden sand, a few yards from the glittering surf which fringed the marvellous stretches of the lake. Far away to the left and right the high mountainous coast gradually melted into the bluish haze of the dry season.

A hundred yards from our camp a rocky projection thrust itself into the lake. We climbed up the side. On the summit of short grass stood a block of rough stone: "Here lies Captain Emil Popelin, born 1847, died May 24, 1881." In such a place, before such a memorial, you forget the cement works, railways and factories which have sprung up in all parts of this immense continent, and you realize how very little time has passed since the day when the first white men, after months of journeying, arrived at the steep and rocky shores. What exaltation, what immense joy must have seized them, when they discovered after so many forests and so many grassy steppes this incredible stretch of clear sweet water!

The worthy chief of M'toa had little authority, and certainly appeared incapable of persuading his men to work for us. When at dawn the next day we saw neither *pirogue* nor oarsmen, I went back to the village and called on the chief. Stretching himself, rubbing his eyes still heavy with sleep, he came out of his house with a young wife at his heels. He seemed very much annoyed to learn that his orders had not been carried out, and promised me that I would have all that I wished in an hour. He was wearing a wrist watch, but I noticed that it was not working. My presence caused him to make a real effort to engage men; however, he met with no success. The villagers knew that it was not the *Bula Matari*, the territorial administration, which demanded the irksome task, and in spite of promises of generous *matabichi* (tips), idleness prevailed and they pleasantly wished their chief to the green devil.

It so happened that an old European lived there a hundred yards from the village. This was a tall thin Englishman, nearly blind, who spoke French and Swahili with the same British accent. Mr. John Purdue had settled at M'toa for nearly thirty

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years, after having had to abandon his profession of elephant hunter because of a tropical disease which had partially destroyed his sight. He did some business, buying native products which he sold to the industrial communities of Albertville, and selling cotton goods, hardware, tinned food and Coca-cola to the negroes. He lived alone with his household of four or five, supposedly indifferent to solitude, phlegmatic and cold in manner like the artillery officer he had been up to 1918, but in fact really sensitive, kind and terribly isolated.

Purdue lent us his big canoe and had an outboard motor installed to make us independent of the uncertain man-power of the region. Thanks to him, we were able to set off, with scarcely any delay in our programme, towards a little island two miles square lying about six miles to the north. One of the bays of this island, Capart had told me, was teeming with crocodiles.

The outboard motor broke down two or three times, but managed, after three hours' travelling over a lake of glass, to bring us to the lower part of the half-mooned shaped indentation which cut into the island's western edge. As we approached skirting the shore, we could see frightened crocodiles throwing themselves quickly into the water, one after another. Some were enormous, more than fifteen feet long, and of a fine green colour; as a prospective bather, I must admit that the sight of them made me shudder.

We unloaded the enormous cage; then, while Louis, with the help of Purdue's black mechanic, was setting it up and screwing on the floats, I prepared the diving outfit. Everything was ready at last; the heavy cylinder was slid into the water; I made my way inside as quickly as possible to keep any wandering crocodile from sampling my leg, carefully shut the door behind me, and was in position for the experiment. A rope sixteen yards long linked the cage with the boat which moved off slowly, propelled with a paddle so as not to frighten the crocodiles and towing behind it the cage, which floated five yards below the surface.

Seen from the inside the water was not particularly clear. Visibility hardly exceeded twenty-five feet because of the numerous particles floating there. Our advance continued. Behind the glass of the diver's mask I kept my eyes wide open, eager to see my first crocodile. I realized then why nature has

made these monsters green: the water which seemed perfectly blue from the outside because it reflected the clear blue of the sky was here made a clouded green by the microscopic algae and plankton. On this muted emerald ground a crocodile would appear as no more than a greenish ghost.

Time flowed on. Not a single crocodile crossed my field of vision. And yet it has always been said that anyone falling from a ship runs an immediate risk of being snatched up by one of them, and tales of such happenings are legion. In my present situation I was surely—apart from the cage—sufficiently like a drowned body to inflame a crocodile's appetite, according to this hypothesis. But far from it! Only some fish and jelly-fish appeared, then disappeared, in the course of our slow advance. And yet we were supposed to be in the very haunt of the creatures.

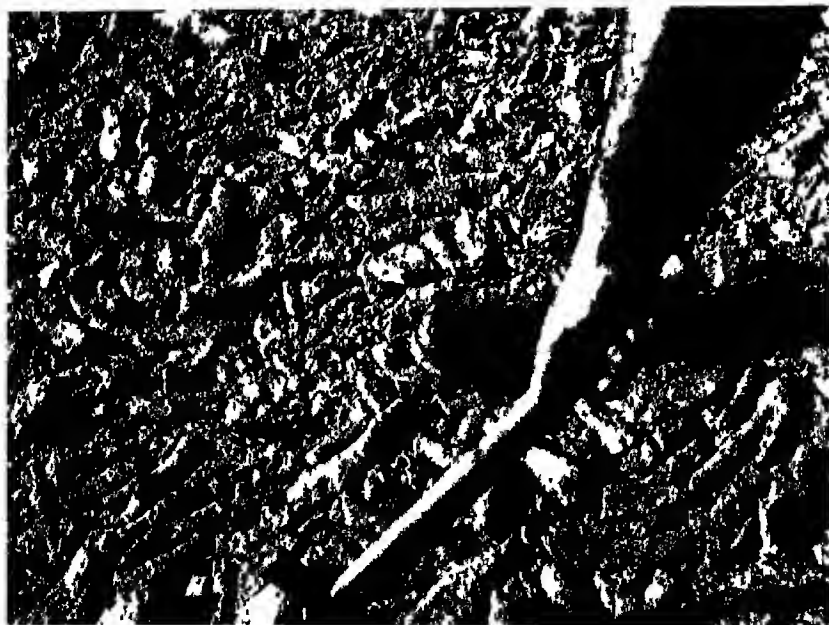
After ten or fifteen minutes I felt the cold overcoming me in my prison. The water of Tanganyika is less warm than that of the Red Sea, and being unable to move in my narrow cage, I began to shiver. Up above, however, Louis and his three companions continued to skirt the island shore, cautiously paddling under the hot tropical afternoon sun. I realized then that we had omitted to arrange a signal system, and I had no means of asking to be hauled up. I tried to defeat the cold by rapidly working all the muscles of the body in turn. At first this was surprisingly effective. Then fatigue slowed me down and my production of home-made calories became inadequate. There was enough air for two hours in the cylinders, but I earnestly hoped that Louis would not keep me below all that time.

The long minutes passed, still without a crocodile, but in a degree of cold that was more and more difficult to endure. Numbness was paralysing me. I told myself then that if the crocodiles were sufficiently frightened by the boat not to come and sample the nourishing man directly in their way, there was certainly little likelihood that they would come if the bait emerged from the cage. Comforted by this reasoning I unlocked the lattice gate and slid outside. How good it felt to move again! I turned a little to the left and right, still hoping to spy some long reptilian silhouette, but in the opalescent water I could see nothing apart from some ravishing little jelly-fish, quite transparent, like delicate flowers. Disgusted, I made for the sur-



7. *A piece of coral on the sandy shore*

Coral fossils





8 *The field laboratory on Abi-Lat*

The emerged coral reef, sparkling white



CROCODILES

face and was hauled into the boat, where I abandoned myself to the burning sun.

It was evident that the flight of the crocodiles was connected with the vessel's approach. As we went on we saw a number of them floating, their eyes and the tips of their nostrils just breaking the surface. We had to look very hard to distinguish them before they dived down and disappeared in the depths below. Louis and I in turn made one or two more attempts, always without the cage, first here, and later in the great bay of Baraka where crocodiles also abound. But in vain.

We knew already that crocodiles lacked courage on dry land. It is exactly the same in the water. Everyone knows how timid lizards are, and excuses them because they are small and fragile. To understand the crocodile's psychology you need only observe the cautious manner in which lizards approach their miniature prey—some insect, or other little creature—and then imagine the tiny animal of a few ounces turned into a reptile weighing several hundred pounds, and the insect into a man, cow or antelope. This creature is no more than a monstrous lizard whose cowardice has not the excuse of weakness. If it attacks the swimmer at the surface this is probably because its victim really seems without defence.

Strong in my theory, from now onwards I went down without fear alone in my diving apparatus. Without fear, but, alas, without much hope of meeting one of these creatures under the water. However, once in that submarine region where the green turns to a mysterious midnight blue, among the rocks rising abruptly out of the unknown depths, I was struck by the tragic quality of this strange world, and a sense of anguish overcame me at the idea of meeting an adversary with such enormous jaws and terrifying teeth. The desire to rise to the surface, to flee, was almost irresistible. But I clung to the theory that "they are even more frightened than I am"—and I really believe it was true!

To make up for our disappointment I actually killed a crocodile by a shot in the eye at a hundred yards from the boat, just before it had time to disappear. Louis, without even diving gear, went down more than twenty feet to look for the corpse. After that, I believe he could have made a career in the district, if he had wished, as High Chief, or Master Sorcerer.

Chapter Eighteen

NORTHERN FRONTIER PROVINCE

TO THE NORTH of the Great Rift Valley of East Africa lies a vast and little-known lake. It was discovered in 1888 by Teleki, the Hungarian explorer, who named it after the Archduke Rudolf of Austria. Starting out from the coast of Zanzibar in 1886 at the head of a powerful expedition, Teleki reached the southern end of the lake after a journey of several months through an almost desert region peopled only by a few wandering tribes. There the travellers found themselves faced with an active volcano which the geologist of the expedition, Von Höhnelt, described, and called *Teleki Vulkan*.

Fifty years passed, during which several attempts were made to reach this volcano. Nobody succeeded, and Teleki became something of a legend. Even those who had managed to get fairly near to the place began to doubt if the volcano really existed.

The trouble has always been that the region in which it lies is a terrible place—a sort of chaos, inhospitable, wild, deficient in water or sources of food, and swept by fierce tribes. In 1919 a new eruption shook the district; the sky reddened on the southern coast of Lake Rudolf; the earth trembled. But even then nobody could get near enough to see anything but the red glow of the lava in the night. In 1934 one man, who having previously failed in two attempts was well aware of the difficulties, managed to reach the goal. This man was an old District Commissioner called Champion, an enthusiastic cartographer and geographer. He described the volcano as a little cone less than three hundred feet high, inactive at the time of his visit, and surrounded by a chaotic mass of solidified lava.

Since Champion's expedition no one had seen Teleki.

To-day Lake Rudolf is still difficult of access, though a motor road allows travellers to reach a point of the western

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shore quite easily from Lodwar onward. It is equally possible to get to a point not far from the opposite shore, but only in lorries or land rovers journeying in convoy. Moreover, you must have a permit from the British authorities, and these, fearful for the safety of possible travellers, will grant it only after a thorough investigation. The celebrated American geologist



Bailey Willis wrote: "This lake stretches out into the Northern Frontier Province of Kenya, in the middle of an inhospitable desert inhabited by warriors who cannot be kept in check. It is entered only by armed expeditions whose objectives justify the expense and risk." Twenty years have passed since Willis wrote these lines, which are enough to provoke any impetuous traveller to make the attempt.

To-day the risk of attack from nomad tribesmen is considerably diminished, and there is even a path for tourists in the Northern Frontier Province—the motor road joining Nairobi to Addis Ababa, the Abyssinian capital. Along this road there is a regular traffic of Somali merchants and patrols of the Kenya police. Unfortunately this excellent route runs very wide both of Lake Rudolf and of the volcano Teleki.

Yet it was these that I was determined to reach. Not only because the venture was difficult, and therefore a challenge; but also because the descriptions given by Von Hühner and Champion did not tell me enough about the volcano itself. Would it, after all this time, still be in activity? Was it, like Longonot or Suswa, isolated at the bottom of the Rift, or was it part of a powerful group like the Virenga which cross the western *graben*?

I was not the only one to dream of this legendary country; during his fifteen years in Kenya my old friend Jacques Richard had thought about it, too. The sixty volcanoes that he had visited in different parts of the world, the twenty or thirty eruptions he had seen, had only increased the lure of Teleki the inaccessible. United in our desire, we laid our plans.

Rumuruti is a little administrative post almost lost in the immense plains of dry grass scorched by the sun. Behind us, bluish on the horizon vibrating with heat, were the mountains whose thick forests sheltered the formidable bands of Mau-Mau: Kenya to the east, the Aberdares to the south. We had come into the immense grass lands of the pastoral tribes: in the *duka* or market-place, we came across our first Samburu, magnificent in their noble, lean and nonchalant grace, their bodies draped only by a simple reddish cloth thrown carelessly over the shoulder. Their faces, smeared with a gleaming mixture of grease and red ochre, might have been those of the most admirable Indians in Fenimore Cooper; their walk, with its long strides, was lithe and graceful. If they stopped to look at us they would immediately lean, with an almost feminine elegance, on the seven- or eight-foot spears from which it seems they are never at any time parted. They belong to the same race as the powerful tribe of the Masai; compared with them, the Bantus appear thickset and heavy. These tall Nile-dwellers were until

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the arrival of the Europeans the terror of the non-nomadic peoples who had the ill fortune to live on the borders of the steppes grazed by their innumerable herds.

At Rumuruti we had to hire a lorry to make up the "convoy", an indispensable condition if you want a permit for the province of the North Frontier. We hoped to find some vehicle of the type of our land rover, but we had to be content with a three-ton Chevrolet. A Hindu shopkeeper, fat and ingratiating, tried to reassure us, explaining that he had already sent the lorry on the road to Baragoi, and "if it could go to Baragoi, it could go to hell itself!"

"Not with those tyres," I murmured to Jacques Richard, who was conducting the negotiation. But Richard had all the trouble in the world to make the old fellow, who was as cunning as he was polite, admit that it would be better to have tyres which were *not* perfectly smooth if they were to turn on the sand. At long last, however, the contract was made, the tyres replaced, and cans were taken on, one of petrol, one of water. To these Richard added two old Morris armchairs that he had unearthed from the recesses of the shop. Seeing my grimace at the grey dirt of the upholstery, he said:

"You'll soon see, it's quite the best way of travelling: you sit up there in comfort and look over the landscape as if you were in an observatory."

At ten in the morning we paid a visit to the District Officer, a big hearty fellow, with a blue shirt open over a hairy chest. Since dawn he had been battling with the daily problems of his work: administration, reports, native palavers, upkeep of roads, organization of Home Guard patrols against the Mau-Mau, and I don't know what else, and, still snowed under with work, he had not yet found time to have breakfast. But he gave the impression of doing all this with unfailing enthusiasm, and a mixture of humour and real goodwill which won my admiration. These fellows are quite extraordinary.

Maralal is the last European post before the stretches of desert which merge into Ethiopia. In a short stroll you find a few bungalows built between clumps of trees; the District Commissioner's office, a tall pole by its side with a flapping Union Jack at the top; the broadcasting station; the *duka* of shops kept not by the Hindus here but by the Somalis; the

Greek merchant's store; the village of native huts. But, above all, Maralal holds the source of life itself—the great pump with its raised handle which stands over the well, sunk deeply in the rock. There, the whole of the day, black with flies, laughing and chattering, the women from leagues around queue to fill their goatskin carboys with the clear water.

We had to wait for the return of the District Commissioner ("gone down to Nairobi") who had to stamp our passports. Any delay was serious for us, because of the rains. I believe—although we're not usually gate-crashers—if we hadn't been in British territory where one is automatically trusted, we would have continued our journey without further ado. The English, more than any other nation perhaps, respect the right of the individual. The individual in turn, respects the law without its being forced upon him. It gave us a peculiar pleasure to see "You are requested not to . . ." instead of "*Strengt Verboten*" or "*Strictelement Defendu*".

A day was spent in waiting, then another. We burnt with impatience, since the time of the rains was approaching. They fall twice a year in this region, for a few days only, but in terrifying downpours such as only the desert lands know, and we were afraid of being cut off for weeks by flooded watercourses. The Goanese clerk said that his chief, the District Commissioner, was expected at any moment, and once an hour we called again at the tiny office in the small clay house. The clerk seemed overwhelmed by the responsibilities which the absence of his chief laid on his head, and our impatience made him nearly distraught. A chance word from Richard was the final straw, and he almost wept as he exclaimed:

"You have a Kikuyu driver? But the Kikuyu are absolutely forbidden to enter the region!"

"Now look . . ." Richard tried to explain to him that not only were we of good character but acting with official backing. "Look, the D.C. of Rumuruti himself has given us a visa for this man. He has known him for years."

"Ah, no, sir, no, it is not possible. The D.C. *must* have made a mistake. It is strictly forbidden for Kikuyus to come here. You must send him back to Rumuruti."

He succeeded at last in making us really disturbed, and for two long days we remained in a state of perplexity—would it

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not be better, without waiting for the Commissioner's return, to save time by sending our Kikuyu to Rumuruti carrying a letter asking for a driver of another race? But we knew very well that there *was* no other. These were grave problems; if we could not take our driver there would be no lorry, therefore no "convoy"; and no convoy, no permit! The temptation was stronger than ever to take advantage of the lack of supervision and to start for the north.

Meanwhile we wandered about for hours, from the *duka* to the well, from the Greek stores to the post office.

It is always pleasant, in a country far from home, to come across people speaking your own language; and among the tiny handful of whites in or around Maralal we found two—the Greek shopkeeper, who also spoke English, Italian, Spanish, Turkish, Arabic, Amharic, Swahili, Somali, as well as Greek, and a real Frenchman from France, a native of Saint-Etienne, which he had left twenty years before to seek his fortune in Kenya. After trying all the trades possible in the colony—farmer, gold prospector, professional hunter, agent for cheap labour—he had become an official whose particular job was the upkeep of the motor roads.

"You wish to go to Teleki?" he said. "Well, you'll have a fine time getting there, I don't mind betting."

We were all four leaning over the Greek's counter, drinking orange juice and water.

"You know those parts?" asked Richard, taking out a fresh cigarette from the packet and giving it little precise taps on the counter to settle the tobacco. The Frenchman pushed back his battered wide-brimmed hat from his perspiring forehead and revealed, above his tanned forehead, a thick iron-grey thatch.

"I know them. You'll see: after South-Horr you make for Longerin. There's water there. You continue after that as far as the base of Kulal. You leave the trucks and go on foot to the edge of the escarpment. It is only a half-day's march. From the edge you look, you see the hell down below. Then you choose, to go down into hell, or to return home."

"Not very encouraging, little father," murmured Tormoz.

"My friend, when you know what it is to walk on *those* black stones, under *that* sun, you will understand. Believe me, I know this country."

Orange juice, heat, flies, waiting. . . .

But suddenly the British flag was hoisted to the top of the mast—the District Commissioner was back! We hurried to the office. As we entered, a tall man rose to his feet, smiled, held out his hand. Indicating with a glance the whitewood table which seemed about to collapse under the weight of files, he said:

"I do apologize for having kept you waiting so long. I did not know that you were here . . . and then—we have a little work in hand."

Richard immediately brought up the matter of the driver.

"Mm," replied the D.C., "the regulations *are* very strict. We must protect the unaffected zones from Mau-Mau. But I know this man, and I think he is reliable. In any case, don't let him get far away; don't lose sight of him until you've left Baragoi behind you."

"Why Baragoi?"

"It has a Mau-Mau prisoners' camp several miles to the north west. Don't spend the night at Baragoi, in case he uses the darkness to try to make contact with the camp."

"I understand. Tell me," Richard, his eyes on the glowing tip of his cigarette, spoke almost too casually; "you know the country round the volcano Teleki?"

"I've never been there, but I've seen it from the road. Is that where you want to go?"

"Yes," said Richard gently, looking up with an inquiring air.

The big, solid Englishman raised his thick brown eyebrows, stroked the bridge of his nose, and for reply let out a significant whistle.

"Well, gentlemen, I wish you good luck. And when you come back, my bath is at your disposal!"

Keeping a modest speed on the bad road, we climbed the cedar-covered hills that rise out of the plain behind Maralal. The valleys grew deeper; the air became sharp and thin. Richard and I were sitting in the Morris chairs, on the three-ton lorry; with us were an Askari whom the D.C. had detached for our protection, and three passengers, young Samburu who clearly were travelling in a car for the first time. They crouched

on the floor, silent, fearful, staring with all their eyes not at the magnificent landscape which slowly unrolled about us, but at the two white men near by with their curious luggage.

A few hundred yards in front of us, Louis Tormoz drove the land rover. Behind it clouds of a thick orange dust rose up and spread into the air. In two hours we reached the ridge, nearly a thousand feet up, then began to go down the other side. Several miles to the left, the eastern edge of the Great Rift could be clearly seen, an uninterrupted chain of table mountains which disappeared into the horizon. In the marvellously clear air we could even see, on their steep sides, the thick layers of basalt, one over another. Far below us the pale yellowish plain stretched to infinity, covered with an endless herd of shadows—the shadows of the white clouds which filled the sky. The impression of vastness went beyond that of the sea itself. Out of this waveless ocean, islands rose; isolated hills whose sharp outline cut into the blue. Very far away the path could be seen, a thin thread running straight towards the north from the base of the mountain mass that our vehicles were struggling to cross.

At last we reached a level patch and on the more regular surface it was possible to put on speed. We managed as much as forty miles an hour, and the resulting breeze on our faces was a pleasure in the grilling heat. Among the scorched shrubs and grasses game abounded: herds of plump zebras; graceful gazelles; families of giraffes; pairs of ostriches, those powerful yet ridiculous birds; and sometimes tough and enormous, old uncle elephant.

According to the map there were still two populated centres to cross before we reached the zone marked as desert—Baragoi and South-Horr. We arrived at Baragoi at about four in the afternoon when the shadows were already lengthening. On each side of the road was a row of single-storey shops covered with corrugated iron: the *duka*. Only, here it was not the Hindus but the Somali who were the shopkeepers. Besides the *duka* there were the wells, the administrative offices and the Catholic Mission run by an Italian missionary, the only European in the place. As for the British Government, that was represented by a little Kikuyu clerk, lame, spectacled, unquestionably educated and intelligent. Did *he* belong to Mau-Mau?

CENTRAL AFRICA

The *duka* swarmed with nomads who had come for water from those arid lands about us where their herds do their best to graze. We saw there our first Turkanas, a tribe of Nilotic (or Nilo-Saharan) shepherds, who wander in the vast regions to the south and west of Lake Rudolf. They are tall, but less fine, less handsome, and blacker in colour than the Samburu. Numbers of them were passing: women with wrappings of stiff brownish cowhide round their waists, their arms and legs weighed down with dozens of thin metal bracelets pushed closely together; men with enormous head-dresses held in place by a casing of grey hardened mud, but otherwise scarcely clothed at all, carrying round their wrists a curious circular knife which enables them, in a fight, to attack from any angle. In the midst of this crowd strolled a gigantic old man, wrinkled, bent, impassive, his face covered with a crackling mask of red earth, a scarlet ring through his lower lip, amulets round his neck, three ostrich plumes stuck into his heavy "bun" of hair, and over his shoulders a splendid leopard skin. In one hand he carried a slender lance or spear, a rod and a wooden head-rest worn smooth by use; in the other a fly-switch made of white fibres set in a haft decorated with coloured beads. This man was a magician, an *ol oiboni*, the one to whom all the members of the tribe pay heed, do homage and regard with awe and fear. He passed us by with majestic indifference, superb in the assurance of his wisdom. The usual paradoxical contrast offered itself; behind the priestly sorcerer rows of tinned foods glistened in the cool shade of the shop. At his counter the lean Somali merchant with a quick eye and precise hands served the intimidated crowd of savages, apparently indifferent to the behaviour of his wives who were sitting under the awning, draped in the folds of their white cotton robes. These ladies—adorably pretty creatures with triangular faces and almond eyes—cast challenging glances at the men, whether black or white, with a complete absence of bashfulness.

We made a tour of one of these high hills which looked like islands in the desert plain, drove several miles further on to a dried river-bed, a *laga* where a few meagre bushes gave us materials for a fire, and we stopped for the night. It was now growing cool. A strong wind arose, which tried to tear up everything in its path, and showered us with a hail of little

stones. Our escort had been increased; the black clerk of Baragoi had supplied us with a guide-interpreter, an elderly Kikuyu cross-breed with limbs withered by poliomyelitis.

The branches were piled together; the wind fanned the flames into a blaze. Soon, crouching in the night round the fire, which lit up their faces from below, our men were busy making a meal of the little goat bought at Baragoi. But as for us, who had elected to use the small spirit stove, we were still waiting for the water for our spaghetti to decide to boil.

Later, stretched out on my camp bed, I lost myself in the incredible depths of a blue-black sky filled with millions of sparkling worlds; and the Scorpion climbed from behind the dark jagged ridge of the neighbouring mountain.

The next day we were up at dawn and drove along the desert steppe where it was rare to see even a few dry shrubs growing out of the glittering quartz and mica of that granite soil. At one time we crossed a space covered with debris of black rock, and I stopped to investigate, amazed to find traces of basalt so far from the volcano. But I was mistaken; the pieces that I collected were in fact large shining hornblende crystals, dark green rather than black. This hornblende is not a volcanic rock but one formed in the depths of the earth and brought to the surface, long after its solidification, by mountain erosion. In this plain we were still on the ancient granite rock of gneiss and shale which is the bedrock of all land masses the world over. It is over this skeleton thousands of millions of years old that sediments of seas, lakes or deserts have been laid in horizontal layers, burying it to-day in most places under thousands of yards of thickness. It is this skeleton which has been broken up in recent geological times, hardly more than a few million years ago, to form the great furrows and hollows of Africa, to allow the flow of vast tides of lava and of ash poured forth by the volcanoes. I hoped at any moment to find myself at the meeting point between the old basic granite and the basalts recently escaped from the fissures of the Great Rift.

After several hours the soil gradually became covered with spiny brushwood. The heat of the day was so intense that the animals were already taking cover; here and there we might still perceive an antelope or group of zebras which would watch us approach, then sharply flee in a cloud of dust. Vainly

I scanned the grey distance in search of a rhinoceros. Apart from the crocodile, the rhino is the only beast that I have really wished to shoot, and it was chiefly with this intention that I had brought with me an 8.6 Magnum Mauser rifle.

I never managed to meet a single one outside the game reserves in which, I need not remind you, they are sacrosanct.

The path led directly to one of the mountainous "islands" rising out of the arid sea of the steppe. The nearer we came, the larger the obstruction seemed to grow, nor could we see a single break through which a car could pass. Why, I wondered, should a road be made to lead straight *into* a rocky mass instead of skirting round it on one side or another?

Soon the stony horizontal ground on which we were travelling gave place to undulating sandhills with a fairly dense growth of thorny plants; and the path took a sinuous course into a narrow valley which suddenly revealed itself. We found ourselves in a miniature forest of high spiny acacias whose wide, flat umbrella-shaped arrangement of boughs and leaves formed a translucent ceiling over our heads. Innocently curious, a giraffe, we presently observed, was watching us; but the creature became frightened; it rose on its hind legs, turned, and galloped away in its curious fashion—something between flying and swimming. I was at that moment at the wheel of the jeep and started in pursuit, for it was not the ordinary giraffe (*Giraffa camelopardalis*, of a light fawn colour, almost pink) but the Somali kind (*Giraffa reticulata*) of a rich brownish red—a kind that is found in no other part of the world. After several twists and bends to avoid the trunks of the acacias, I arrived on the flat surface of a *laga* of firm sand and pressed the accelerator. The giraffe was even then no more than thirty yards away, but although according to the speedometer we were doing thirty miles an hour, and the creature seemed to be gliding or floating along as if in some aerial fluid, its strange ambling gait was swifter than the speed of the land rover, and soon I saw no more than the tiny head sailing like the mast of a ship nearly six yards higher than the tops of the trees.

At last I pulled up. For some seconds I could still hear the muffled thud-thud of the fleeing hoofs, then the burning silence was broken only by the monotonous cooing of the African turtle-dove. I remained there, surrendering myself to the burn-

ing, vast and motionless presence of Africa. Soon tiny flies came to dance before my nostrils, my mouth, my eyes, my ears, tracing their fragile, exasperating network a mere half-inch away. This, too, was Africa, showing the same face over thousands and thousands of miles.

I switched on the engine again and, cutting through in a north-westerly direction, made haste to return to the path; I caught up with the lorry just when it had reached a wide clearing formed by the opening of an almost perpendicular valley. The driver went ahead, and I followed him, under splendid mimosa trees spreading out their light foliage high above our heads. As we continued on the left side of the valley, an enormous elephant started up on the right—the heaviest, most powerful of all land creatures. Five minutes earlier we had disturbed the tallest of living creatures. Africa. . . .

We passed a herd of goats kept by a little naked boy who stared at us open-mouthed; then suddenly the valley seemed to shrink, the rocky walls strained to touch each other, and we stopped beside an old greyish canvas tent in a little grove of spiny bushes: South-Horri! This name, which was written on the maps in letters as large as those of Rumuruti or Thompson's Falls—veritable cities by Central African standards—in fact applies to nothing more than the tent of a Somali merchant set up beside a spring! I understood now why the path had not bypassed the mountainous island: in the desert it is the water points, not the smoothness of the contour, which decide the way.

South-Horri was crowded—relatively speaking, of course. There were some twenty men and women and a handful of children. A few Turkana women had just come down from the mountains when we arrived. Each carried on her head a long roll of dried cowhide to sell at the Somali market. When they perceived us some fifty yards away they stopped still, lingering in an uncertain way for several long minutes. So long as we seemed to be looking at them they remained where they were, whispering among themselves; but when we paid them no more attention they made up their minds, scurried down the slope and threaded their way into the canvas-covered trading centre, chattering like a crowd of birds.

The Turkana women cannot rival their Samburu cousins. The Samburu girls are magnificent, with their light bronze

skin, straight noses, almond eyes, pensive air, and, when they are young, their high, pointed, perfectly modelled breasts. Round their heads they wear a narrow diadem of coloured beads, a sort of jewelled chain to which some of them add a flat metal ornament which hangs over the forehead; and many of them wear immense crescent-shaped pendant ear-rings. Their favourite decorations, besides the discreet tattooing of the stomach and the numerous shining metal rings encasing their arms and legs, are the stiff collars of many-coloured beads arranged in decreasing widths from the shoulders to the chin.

In spite of the extended lobes of her ears, in spite of her close-cropped head, in spite of the earth-coloured cowhide which served her for skirt, one of them, in the perfection of her features, in the dreaming sweetness of her copper-hued face, was as beautiful as a princess of ancient legend.

The water lay seven or eight yards down, in the hollow of rocks worn to smoothness which formed the bed of the stream. The women went down to fill their goatskin water-carriers, dipping the water out with a gourd or a wooden ladle. This was the centre of life in a region the size of an English county. It was here that men, cattle, and wild animals came to drink or renew their water supplies from as far as twenty to sixty miles away.

In the high mimosa boughs whose light shade lent the place the added charm of a relative coolness, birds were twittering, flitting from branch to branch, their feathers glinting with metallic colours.

Beyond South-Horr the path became something of a myth. It was recognizable only from the vegetation, in which a band the width of a lorry had been cleared. However, once we had left the mountain mass of Oldonyo Mara which shelters South-Horr (Oldonyo means mountain in the language of the Nilotic peoples of Kenya), we could put on speed a little—that is to say, we could rise to ten or even fifteen miles an hour. After a time we reached a place which for some reason appealed to our guide, since he peremptorily made us leave the path to turn towards the west through the bush. As for the “route”, that continued towards Mount Kulal, an enormous extinguished volcano which stood out on the northern horizon. We had reached the latitude of the southern edge of the legendary Rudolf.

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Gravel, sand and stones, the soil here was identical with the soil of the path, but we had to thread our way with unceasing care between the thorny bushes which looked curiously like apple trees without leaves. They were, I imagine, *Commiphora*, whose hard branches make a grey curtain almost impossible to see through.

We met a procession of Randille women with camels. The Randilles are another of these nomad tribes which use the east of the lake for grazing. These four camel-drivers were returning from South-Horr. They had gone there to refill their water skins which, stretched to the limit, hung at the camels' sides as well as what appeared to be giraffe-skin buckets fastened to their rather primitive pack saddles of woven branches. It was already a day since they had left the water-hole; it would be two more, our interpreter told us, before they got back to their encampment. Three days to go to the well, three days to return.

Like the Turkana and Samburu women, they were dressed in cowhide, and adorned with numerous bracelets, wide earrings and rows of neck rings which came down to their shoulders like armour. Their hair was arranged in a kind of crest, straight and high like the helmet of Minerva; it was held in place by a coating of dried mud.

They were startled at first, but before long they were laughing loudly at the sight of us ridiculous strangers who were circling round them with our cameras and films. Then, having amused themselves enough at our expense, they reassembled their camels and, forming their long file again, continued their journey, graceful and imperturbable, to the north-east.

Presently we passed, at about an hour's distance apart, a Randille and a Samburu village. They were very much alike, except that the inhabitants of one had black skins and those of the other a golden brown. These "villages", in any case of a temporary nature, contain no more than a single family—perhaps, even, part of a family, for the only grazing available for the herds in this arid land is much too meagre and sparse to allow a more substantial community to assemble. Whenever the nomads move from one "pasture" to the next, they build a habitation: this consists of a few huts made of bent branches intertwined to form a half-sphere, then covered with goat-skins.

If there are several huts, sufficient space is left between them

to hold the entire flock; then this space is surrounded by a ring of spiny branches; finally an outer enclosure is made of the same natural barbed wire. One or two passage-ways are left in this defence, but all such lanes are blocked during the night with bunches of thorns. Inside the prickly walls of this *man-yatta*, men and beasts are sheltered from hynas, leopards, lions, and also from human enemies.

We drove along for an hour towards the mountains which barred the horizon to the west. A tall slender peak stood out on our left—Mount Nyiru which, with the volcano Kulal several leagues to the north, is the highest point of the region. Sudden torrents would sometimes fall from the sharp slopes of Nyiru, and we had increasing difficulty in crossing the beds of dry sand sunk between the extremely steep, occasionally overhanging banks. The land rover made child's play of these difficulties, and it served as a sort of scout for the lorry. Not only did it not get bogged in the sand but it sometimes had to turn back to help the three-tonner. And on the other side of the horizontal bed, with its relics of the latest downpour—shattered tree trunks, lumps of rock torn from Nyiru's side—the problem of climbing up the opposite bank was no less disturbing than that of getting down.

The nearer we were to the mountains, the more numerous and the more deeply sunken these torrent-beds became. So, fearing that the lorry would *finally* be wedged beyond hope in some particularly difficult stretch, we decided to stop and set up the day's camp. The tent was pitched in a clear space, and while we unloaded the vehicles in order to choose what we were going to take with us on the expedition, Malisele, in the scent of burning mimosa wood, cooked the rice and fried the bacon.

Sitting in front of the tent we watched the evening sun painting the bare smooth sides of the neighbouring mountain a warm gold. Something rather like flies moved on those crests. Could it be men? Who could possibly be spying on us from those heights? I raised my binoculars—and saw dozens and dozens of monkeys, great dog-faced baboons with thick black manes of hair, some of them going on all fours to the left and right, others squatting down in groups along the edges of the cliff, seeking the last rays of the sun's heat before night fell.

Far below in the valley, at the very foot of the hills, our guide knew of a Samburu *manyatta*. These Samburu owned some asses which we might be able to hire. There could be no question of using camels; the country that we now proposed to enter was much too rough for them. At the same time, pack animals would be essential, since all drinking water would have to be carried with us. And this was not the only reason; the nomads of the desert, unlike the Bantus of humid Africa, refuse to do the work of porters. Only the ass, in these wild mountainous regions, can perform the work that an expedition of this kind involves.

We loaded the land rover with everything that seemed indispensable for the journey. The lame guide, Richard, and I, squeezed together in the front, and Tormoz left on foot with the Askari who possessed, we had just learnt, the delicious name of Lacedemon. He was relieved that we had not gone any farther with the lorry on the previous evening, for not only was the local ground rugged and split, but the bushes grew so thickly that it was no longer a question of skirting round them: you simply had to drive through. And that was a formidable business, for each tree was bristling with hundreds of thorns an inch long, extremely hard and sharp as nails. At the first bush that faced me I screwed myself into knots behind the wheel at the anguished prospect of hearing the hiss of air escaping from my tyres. The car went on; we heard the rasping of the spines on the underside of the boards beneath our feet, and against the paint of the doors; the barbed branches lashed the windscreen; we felt them catching in the thick canvas hood, then springing away; but in spite of all my anxiety the tyres, as far as I could see, were still perfectly normal. When we reached a clear space I got down to look. The wheels were bristling with thorns as a bull with banderillas. Nothing had yet penetrated the outer surface, but that was surely only a matter of time. I started off again in low gear, for the ground was becoming particularly difficult, and we charged along regardless of obstacles. The trees now were meeting and interlacing, branch with branch; it was only just possible to squeeze between them, and I soon came to the conclusion that the best way of advancing was not to avoid the trunk, for then you would only be wedged in the boughs and leaves, but to drive straight on to the trunk with

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the centre of the bumper. It was an extraordinary sensation to feel the tree yielding under the attack, gradually bending down to the horizontal or breaking off; then to plough through the opaque grey mass of thousands of spikes from the crushed branches. We might have been plunging, sealed in a submarine, into some strange, hard, secret underworld.

The most astonishing part of it was that the tyres continued to hold.

"Richard," I said, "have you thought of the repairs in wait for us when we are through this pincushion?"

He smiled. "Have you thought of a way of changing wheels and tyres while we are here? We haven't even brought our suits of armour!"

But the tyres held. Of excellent quality, their rubber surfaces resisted the pricks and spines and thorns. It was the thorns, in fact, which broke, leaving only their pointed tips in the rubber. When these had finally worked their way through, and the first punctures appeared, we were bowling along the smooth asphalt of a road in France.

Here, however, the ground had become unbelievably bad. Not only were the four driving wheels engaged, but, the bottom gear not being sufficient, we had constantly to make use of the second gear-box with which our vehicle was equipped, to engage a still lower gear. We were going at a mere walking pace. Yet in spite of this the power of the engine was something really exciting; nothing it seemed could resist us; and in actual fact we overturned trunks eight inches in diameter; we descended almost vertical banks; we passed over frightful holes; we mounted slopes, rearing up almost at right angles. There is an intoxicating sensation in the act of driving when the driver feels identified with the machine and the force that moves it. This was no longer a land rover: it was a tank!

At last the trees thinned out and we reached the foot of the hills and stopped under the thin shade of two tall acacias. A group of Samburu women and their naked children watched us in some astonishment. But they were not afraid and did not run away when we alighted and went towards them. They merely stared, scanning us in detail from head to foot with an increasingly amused curiosity. Verbal contact was made

through our ancient guide, who hobbled along in our wake with the help of his two long spear-like sticks. Soon the women began to burst out laughing, old and young alike; it was far from flattering. Evidently they were unaware of the psychological superiority of the motorist over the pedestrian! In any case the Samburu, like their cousins the Masai, are a people not only resistant to what we call civilization, but superbly disdainful of all European clothes and objects. They continue to live in the fashion of their ancestors, and even fifty years of contact with the whites do not seem to have altered their mode of living in the slightest degree. The British have understood their desire for independence, and they do not interfere with their nomadic peoples. They simply keep an eye on them and try to prevent them from following their warlike instincts at the expense of the sedentary Bantus. And, even at Nairobi, in the very heart of that modern city, you may come across some of these tall, slender creatures, wearing nothing but a scrap of cloth at the waist, with long spears in their hands, their faces covered with red earth, striding gracefully along the pavement, and covertly staring, with an expression half shy, half mocking, at the new world which for the moment surrounds them. If the Masai have not allowed themselves to be affected by our civilization in spite of their acquaintance with it for half a century, it is certainly not hard for the Samburu, isolated in their semi-desert and armoured with an identical disdain, to stay untouched.

An old man with grey hair came out of one of the three hut-like dwellings of the *manyatta* and approached with short steps, leaning over his staff. We exchanged greetings, we in Swahili, he in Samburu; then the old man, our guide and the Askari squatted down side by side and the discussion began. Yes, they *had* some asses, but they had "gone to eat water". Where, at South-Horri? No, in the mountain, quite near. Quite near—that means how many days' journey? Quite near, at Lonjerin, half a day away. . . .

A boy was sent to find them and while we waited we discussed once more the route of the expedition and the probable time it would take. There could be no question of following the route of Teleki who, sixty years before, at the head of a powerful expedition of five hundred porters (only two hundred

of whom returned alive to Mombasa), had skirted the cliff which runs along the edge of the Rift. A. M. Champion, who had reached the volcano at his third attempt, had left from Lodwar, the other side of the furrow, a hundred miles from here. For a long time we had rejected both these ways of approach; up to Baragoi we were still unable to decide between three possibilities based on the dubious information that we had managed to glean from people, and on the hardly less dubious maps of the region. One was to continue by the motor road to the height of Kulal where the path nears the eastern edge of the lake, then to go down towards the south along the shore; that was the "hell" route of which our Maralal compatriot had told us. The other ways consisted of skirting the mountain pass of Nyiru by the south or by the north. We had chosen the northern route, on the advice of our lame guide.

And here we were.

Now what? In addition to the map we had the landscape itself at our disposal. Unhappily the mountain barrier which separated us from the Rift reduced this advantage to nothing. If we had not had a native guide, we would have left for the north to by-pass this little chain—only a few leagues long, it seemed. Or else we might have gone straight in the direction of our still invisible objective. The locals frowned on both these plans: it was necessary to go towards the south-west, for otherwise there was no road. *Were they behaving in the traditional manner of native guides, who assure you that the way you wish to take is strewn with insurmountable difficulties?* All we could do was to trust in them, though according to our surveys and maps the volcano lay to the north-west. But as they obviously should know better than ourselves, we came round finally to their opinion. It was, however, impossible to make them state how long it would take to get there, and how long to return. The map, if it was to be believed, indicated a distance of some fifteen or twenty miles as the crow flies. If we took the precaution of doubling it, that made forty miles in one direction, and as much in the other; four days' march in all.

But such was not the view of the old man, nor that of the guide (he, in any case, would not be strong enough to accompany us and would wait here in charge of the lorry). The old man seemed to be saying that two days would be sufficient for

the whole journey. Only, it was difficult to be certain about anything he said, for he explained himself in his own idiom and the guide translated it into Swahili. Moreover, like a good African, he would not be precise about detail, and, also like a good African, he was careful not to contradict us, even if we deliberately uttered some absurdity to try him. Thus, when we suggested that we should allow two weeks for the expedition, he replied, "*Ndio, Bwana.*" ("Yes, sir.") Then he attempted, very diplomatically, to make us understand that a fortnight in such a terrain might perhaps be too much for the animals—perhaps for the men also—and that it would be better to try to go a little more quickly. Finally, it was decided to bring provisions for three days, and only the indispensable equipment. But where does indispensability begin? For the true nomad, it seems that the strict *minimum* consists of his weapons and the amulets or charms that he wears about him. For a civilized man, that can be going too far. We had, all the same, to be pretty severe with ourselves, for we knew that we had only four asses at our disposal, and that each of them could take no more than eighty pounds or so. Included in the three hundred pounds carried between them there had to be water, the first essential: a gallon a day for each man—the bare stoic minimum when travelling through the desert. Three Europeans, three natives: six gallons a day. Three days, twenty gallons of water.

"It's a good thing that donkeys don't run on petrol," observed Louis, thinking of what it had taken to keep our land rover going over the last six hundred miles.

The indispensables for us were cameras, films and other photographic apparatus, bags for specimens, medical supplies, and also all our weapons. In addition, we decided to take our camp beds, to be sure of a night's sleep at least among the stones. Finally, there was the tent; ultra-light, but a protection for the films against possible torrents of rain. Food was therefore reduced to a minimum: dry biscuits of barley and rye, cheese, dried fruit, sugar, salt, and some tins of condensed milk and orange juice.

If the Samburu men were scornful of European customs and paraphernalia, their wives, on the other hand, showed a crack in this spirit of resistance: the three lovely golden creatures who formed, with two thin, wrinkled old ladies, the feminine

population of this *manyatta*, had just discovered something which ravished them. They were looking curiously all around the land rover, and one of them had glanced at the driving mirror. She gave a little cry, darted back, gave us an inquiring glance, then, as if drawn by a spell, bent entranced over the little glass. Her sisters joined her, and pressed one against the other, head against head, they continued to utter surprised and rapturous cries.

In the afternoon the donkeys appeared, led by the two men of the family. The men seemed very young. These Samburu were probably not of pure race: they were darker in skin, smaller, less elegant than the other native groups we had met. Some Turkana misalliance, very likely. Our two young men stopped about thirty yards away and, leaning on their spears, their legs gracefully crossed in the form of an X, they turned their long gaze on us, smiling lightly, with an expression which might have been ours when contemplating giraffes. Their faces and shoulders, like those of all the men of their tribe, were painted brick red. In the lobes of their ears were hung large discs cut in the shape of a goat's foot; one of them wore a head-dress covered with the same terra-cotta-coloured clay; it hung down so low on his forehead that it gave him the primitive air of a cannibal in an adventure story. We decided to call him Friday. His brother, whose head was bare, was of finer, almost effeminate, build. For want of further ideas we called him Saturday.

While the women set about loading the beasts with the mad-denyingly leisured tempo of the African, the men squatted round a block of wood marked out with two rows of holes, and, using round pebbles which they moved from one socket to another, they began to play a game of chance which neither Jacques, Louis, nor I could contrive to follow at all. The game lasted as long as the loading: and that was a long time, for the straps of dried goatskin broke easily, and the animals, once harnessed, had an annoying tendency to shake off what they were carrying. It is false to assume that asses are stupid. I can affirm that they are among the most intelligent of all animals—the way in which they managed to send to the ground in an instant what the women took so much time to place on their backs is merely one proof of many.

Chapter Nineteen

MARCH UNDER THE SUN

WE WERE ON OUR way.

The rhythm of our lives had changed abruptly. We had left behind us the inescapable hum of a moving car; we had renewed contact with the planet's essential silence. The silence of the mineral world has a rare quality, and it is all the more perceptible because it is not entire, because it is emphasized by the long sweep of the wind, the clatter of a falling stone, the short guttural call of a camel-driver to his beasts. We had returned to the most ancient of all ways of travelling, the journey on foot. It is also the most noble, for it brings all the muscles of the body into action but leaves the spirit free. At the regular rhythm of our pace we felt, little by little, our western impatience ebbing away, that urgent haste which is always pushing the civilized man towards ends that he forgets as soon as he has reached them, his mind being already full of new objectives. We marched in the vast setting of rocky cliffs, arid water-courses, and the sky, and we knew, as a fundamental truth, that walking is as near to the core of life as breathing. The long marches of the nomad cleanse the soul and give the spirit wings. The man who journeys in the desert meditates or sings to himself; he reflects, or dreams. The nomad never knows the sad boredom of the passenger, that melancholy sense of lost time which weighs down the human parcel transported by train or plane, car or boat. Without anxiety or impatience about a hypothetical future, the nomad, who *lives* his journey as much as his halts, is himself a part of the essential present.

I look at our gigantic Turkana, with the wide smile and piled head-dress topped with an ostrich feather: he possesses that kind of serenity, lightly touched with humour, which seems inherent in the vagabonds of the desert; I have found a similar temper in the Bedouins of Arabia and the Moors of Adrar.

With his two wives, his rabble of children, his hundred goats browsing on the dry, greyish plants scarcely visible to the eye, he knows nothing, in his primitive existence, of the haste which devours each moment of our lives. I would like to have something of his serenity and calm.

With his lithe, majestic gait, this man came with us for half a day, more for the sake of company (strangers are rare in this region) than from curiosity. And indeed, after a brief exchange of words with the three white men (words which neither he nor we understood), and a few smiles of friendship, he detached himself from us completely to chat with Friday and Saturday. The Askari, however, native of Kavirondo, with his regulation rifle, his shorts, his linen jacket and his forage cap, despised these savages, to whom he would deign to address only a few brief words, at long intervals.

The Turkana left us in the afternoon, for a thorn deeply embedded in his thigh for several weeks was causing him pain. The wound had festered; there was considerable swelling under his dark skin, and Tormoz offered to treat it. Sitting on the ground, his leg stretched out before him, the Turkana watched the scalpel entering his flesh without turning a hair. There was, perhaps, as much insensibility as stoicism in this noble attitude, for the Africans are said to be less sensitive to physical pain than Europeans. No matter: this absolute impassiveness, whatever the reason, was impressive.

Indeed, although the features of this man were less fine than those of the Samburu, his face and attitude, we felt, conveyed a certain majesty. On the right wrist he carried one of those extraordinary knives which, at first sight, seem no more than a rather curious-looking bracelet, but which, if you look again, make you shudder. Round his neck was a leather thong, at the end of which, lying against his vast chest, hung two dried testicles. With all the people of these regions the castration of an enemy is the warrior's consecration, and our companion carried his trophy with pride.

His wound now filled with sulfa dust and properly dressed, the giant rose to his feet, took up the two spears that he held together in one hand and, limping somewhat, set off with long slow strides to his *manyatta*.

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By this time we were following a footpath, sometimes well-marked, sometimes hardly visible in the coarse, rough sand or gravel. On the previous evening we had climbed several of the glittering granite hills, only to have the disappointment of *not* seeing from their peaks the longed-for panorama of Lake Rudolf, the Rift and the scattered volcanoes. We had still not reached the promised Hell, and were feeling disconsolate. After we had gone down to the bottom of a deep *laga* and had mounted to the top of the next hill, we found that we had crossed the line of contact between the age-old rocks—the ancient basic ground of Africa—and the relatively recent lavas which spread over their surface at the time when the great fractures were being filled in. This contact was clearly marked. As we headed towards the north, on our right were gigantic hills full of white quartz and mica sparkling in the sun; on the left, crowning a steep bank of grey debris, was the dark and formidable vertical wall, over a hundred yards thick, of a prehistoric flow of lava. The whole landscape was an endless succession of sunken canyons and towering basalt cliffs. These cliffs lay in parallel lines from south to north, the result of a vast system of faults which had split up the stretches of lava ejected through the earlier cracks. They looked like the keys of a giant piano. The only way out was to follow a watercourse until you arrived at some pass or break in the sheer wall.

We had not expected to find a path at all in this region of sun-baked stones, and yet the one we were following was perhaps thousands of years old: ever since the first slopes it had been lined with great mounds of heaped-up stones, the prehistoric tombs of chieftains of long-forgotten tribes. What would we have found under these piles if we had had time to delve into their secrets? Skeletons lying flat, skeletons curled up knee to chin, skeletons sitting up to face the rising sun? Objects of metal or stone, remains of a vanished civilization? The lure of our volcano Teleki must have been strong to tear us away from the desire to raise the heavy mantle of rocks and see what lay below.

But these tumuli were not the only witnesses of a bygone epoch: scattered on the yellow sand from the first day of our march were small black pieces of obsidian lava, a natural glass that is occasionally given out by volcanoes. What were they

doing in a completely granitic zone? I bent down and picked up one or two; they were workshop chippings, the results of a human industry, and it did not take us long to find little obsidian tools, scrapers, blades and points, all perfectly made. It is always very moving to be confronted by traces of vanished generations, even when only a few centuries separate them from ourselves. But when the imagination must leap over thousands of years, when the link is with fabulous ancestors, the searcher is caught up in an almost mystical ecstasy. We collected all that we could of these fragments, convinced that we were on the site of an ancient carver's *atelier*.

The next day we perceived that the whole itinerary was strewn with these prehistoric implements, as if this scantily-marked path had once been an important route of communication along which thousands of travellers had passed. This may, indeed, have been the explanation, and I recalled the vast burial-ground of the Moors, which seemed all the more strange because they were lying in the heart of the Sahara. But if you looked more closely you saw that these funeral places lay all on the side of high ground overlooking bowl-shaped depressions lined with dried clay and strewn with fragments of prehistoric pottery—ancient lakes, in fact. There was a time when the Sahara was not an arid desert, when lakes nestled in the green hollows, when springs of water flowed across the game-filled pastures. Since then the climate has gradually changed, turning into deserts the lands which once were fruitful and inhabited. In Kenya, too, during the stone ages, civilizations were flourishing of which nothing remains to-day but a few bones and a handful of worked flints. We made our way across the desert, reflecting that there was once a time when it was a place of villages and men.

Our progress was slow, much slower than we had expected; that was the fault of the asses—or rather, of the primitive pack-saddles which kept breaking, or slipping under their little round bellies, so that we were constantly having to stop. We repaired the straps, we readjusted the loads, we started again—only to stop and go through the whole process once more hardly fifty yards farther along. At first this seemed rather picturesque. Then it exasperated us. At length, having caught something of the patient wisdom of the nomads, we became

fatalists—I might almost say, actively resigned. Nearly half our time was being sacrificed to these tinkering, patchings, and re-loadings. The fact is that the native saddles, simple frameworks of woven branches held together by fragile strips of goatskin, are not meant to carry rigid objects like boxes, cases and tins, but things like water-skins, animal hides, boughs of trees. So could we blame them for breaking?

Each gap in the mountains brought us the same disappointment, more bitter every time: no lake, no volcano, only a water-course under our feet, a cliff beyond, always the same pattern as before. When, towards the end of the second day, we looked from yet another hill-top and still saw no sign of our objective, our confidence began to wane. At this rate, our water and provisions would certainly not get us to the volcano and back. And the heat, quite supportable at the start, was becoming more and more excruciating the farther we went, for on the other side of each of these parallel crests we went down, every time, into a valley lower than the previous one and, every time, the temperature rose by several degrees.

Thirst was already affecting us; our thoughts flew too easily to what water remained in the four-and-a-half-gallon cans hanging on the pack-saddles. It was a little stale, perhaps, but it seemed delicious to our fevered thoughts as it slapped against the sides of the galvanized iron containers.

Would we arrive to-day at the pool of Laisammis, which we knew lay somewhere along the route? Would we find any water in it if we did? No rain had fallen for more than a year on this side of the mountain.

"*Laisammis, mbari?*" I asked our friend the Askari. ("Is it far, Laisammis?")

He held out his arm, indicating under our feet the wide stony valley.

"*Mbari kidoko* (A little farther)."

That could mean two hours or a whole day.

"I don't trust that fellow," muttered Louis.

Leaving the asses to their cautious gait we hurried down, almost breaking into a run: if we could reach the water point that night the rest of the team would catch us up sooner or later; whereas if we stayed, no one would make a move after nightfall.

It was hot in the next valley, under a sharp slope several hundred yards in height.

Nevertheless, our impatience to reach the wells made us lengthen our steps, and we hurried over the stones and the tufts of hard grey grass that grew between. The desert, like the mountain, can seem to go on for ever when you passionately long to reach the summit or the well. Behind that ash-grey hillock you feel sure that water lies just under the green palms. But now you are there, and beyond the curve of earth on which you fixed your gaze for more than half an hour, you can still see only rubble, stones and a few rare spikes of grass. Then you fix your eyes anew on that far-off break in the hill which hides whatever lies behind, and so authorizes hope. It must be water. You try not to slow down; you make your strides as long as possible, but fatigue and the latest disappointment turn your feet to lead; thirst has filled your mouth with paper, so has anxiety.

We met a herd of goats—hundreds of goats, white, black and brown. They were climbing the slopes of the mountain, urged on by a tiny shepherd boy not ten years old. At the sight of us he turned and trotted away. A few hundred yards farther on we almost collided with two young men, naked and black, squatting down near a thorn bush before the roasted remains of a goat, on a ground so dark that they seemed to melt into it. These were Randilles, and they looked at us with indifference, understanding nothing of our Swahili. To the Askari, they deigned to make the reply:

"Yes, there was water at Laisammis. When the herd was there. . . ."

Another bank to descend, more crumbling stones, more rocks through which the path must wind its way. Below, in the flat bed of the valley that we had followed for some hours, we saw the brutal gash of a canyon that erosion had cleft through the basalt. This erosion was more recent than that which created the valley itself. Could we be, after all, at Laisammis?

We could be, and we were! At the head of a gorge, under an enormous overhanging rock, we suddenly perceived a patch of violet sky imprisoned between the stones. It was one of the most beautiful sights in the world, a stretch of water.

We were not yet desperately thirsty: nobody rushed forward;

nobody lay down on his stomach to drink. We first gazed at it, reassured, feeling rich in the *certainty* that it represented. You are incalculably rich when you are thirsty and you know that you can drink! Then Louis knelt down by the edge, took out his knife, and began to hollow out the solid gravel soil from the bank. The ground was hard, and it took him a long time to reach the level of the water and make the hole deep enough to hold an enamelled mug. Jacques and I squatted down beside Tormoz and watched the gradual working of the filter which would at last allow us to drink water that was clear and clean. The pool was beautiful to the eye, but it was also filthy, full of thousands of goat droppings, yellow with the urine of cattle and wild animals, green with long slimy weeds. Our patience showed indeed that we were not so thirsty after all.

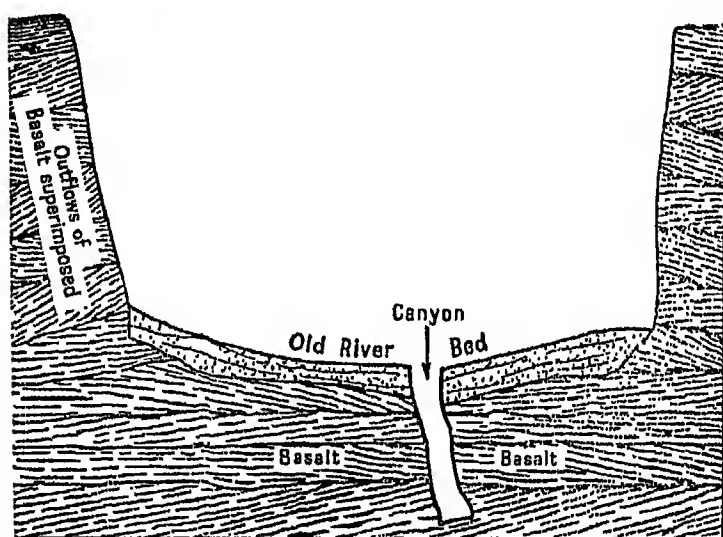
Our three companions and the asses rejoined us before night, almost on our heels. It did seem that the packs broke less often when we walked in front. . . . In the warm darkness the embers glowed softly under nimble, delicate flames. We felt happy: we had drunk; we had eaten; we had drunk again. To-morrow we would reach the lake; the next day we would be on the road back. We lay down on the firm resilient canvas of our camp beds and wearied by our two days' march we savoured the entire relaxation of each muscle. Louis had prepared a final brew of tea. It was our last drink of the night; he had sweetened it by emptying in a whole tin of condensed milk. Our enormous mugs, filled to the brim, were within hand's reach. Richard sipped his slowly; I swallowed mine in great gulps. The sky was so brilliant with stars that it seemed alive. A hyena uttered its long howl. It was not as lugubrious as we had believed; it was an integral part of the vast African night.

We woke in a dawn of emerald green. The light mimosa boughs were filled with the twittering noise of tiny blue birds. And close behind us, sprouting from the vertical rock, was a bush whose fleshy branches bore extraordinary coral flowers: the rose of the desert

While we were harnessing the asses, crows had appeared, first gliding, then swiftly wheeling down to perch in great numbers on the extreme verge of the overhanging ledge above us; there they performed a kind of slow dance in their impatience to see us go and enjoy the remains of our meal.

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We skirted the upper lip of the gorge of Laisammis, a canyon with vertical sides cut into the piled-up layers of hard basalt. It was easy to understand how this valley had been formed: torrents of water widening a fault which had split the thick solidified lava stream, had hollowed it still more at the time of the distant rainy epoch. Little by little the track had deepened until it reached its line of equilibrium, the line beyond which a river-bed cannot be hollowed out any further by the running water. Some tens of thousands of years, perhaps, then passed, and the



Cross-section of the gorge of Laisammis

valley reached another stage of its development: the waters no longer eroded it, but left alluvial deposits, gravel, sand and mud, which piled up in layers over the rocky foundation. After another few thousand years, there was a sudden accident which brusquely lowered the level of the river base, that is to say, the level of the mouth of the stream which to-day has become Lake Rudolf. Immediately, a violent process of erosion started again, deepening though not widening the hole, and produced at last this prodigious cavity. To cause such drastic erosive action the level of the base must have dropped abruptly to that

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of the gorge which resulted from it, fifty yards at least: in the west, towards the centre of the Rift, a new block running along the meridian line had caved in, millions of years, perhaps, after the formation of these enormous furrows had started.

We climbed a new pass, each of us increasing speed up the harsh stone, each hoping but without daring to voice our hope that at last, from the top, we would see the lake. On the peak itself we seemed to have thrust ourselves into the very core of the wind, a hot and terrible gust of great power which seized us in the broad of the back and impelled us forward: the wind of the legendary tempests of Lake Rudolf. We had to set our backs against the wall, wedging a heel in the rock, to keep ourselves from being hurtled down the slope. For, this time, we had to stop: the lake was in sight.

It was an extraordinary moment: after so many years, after looking at so many maps, after having dreamed so much of the very name *Lake Rudolf*, I was seeing it at last, a wide blue streak cutting into an immense landscape of tawny mountains. we had discovered for ourselves the infinite magic of the boundless African land. There we stood, in the fierce, unleashed, unhindered torrent of an enormous gale, of a force fitting the mighty continent. For indeed, it seemed to us that the whole of Africa was spread out under our eyes. The flat plateaux of basalt, with their yellowish patina, lay one behind the other to the farthest limit of sight: at intervals along the vast horizon rose the misted outline of a mountain peak. Towards the centre of this panorama the lake began, stretching out to the north until, far away, it melted into the perfect blue of the sky. What we saw, in fact, was only the southern extremity of this inland sea, the *Basso Norok* of the Nilotic shepherds, a hundred and ninety miles by forty, lying at the heart of the great Rift which gave it birth.

To the south of the lake the landscape had a lunar quality; you could not see the least trace of vegetation, only the sinister black spread of recent lavas over the rust-colour cones of volcanoes whose very craters seemed like gaping wounds. There were dozens and dozens of these peaks, each blotched with the look of disease, a sort of leprosy. Which among them was Teleki? Through the binoculars we saw, on the side of one of the cones, a feathery vapour. Was it the smoke-hole of a living

volcano? Of Teleki itself? If we reached the lake that evening we could reach the volcano to-morrow. It was only a matter of a few leagues, after all.

But they were difficult leagues. We had to pick our way down a horribly treacherous slope full of loose stones. It took us into a wide *laga* at a height (according to the altimeter) of two thousand feet. That is very low, at two and a half degrees from the Equator, in the furnace of a Sudancse desert: in the shade—supplied by one of the asses—the thermometer approached 122 degrees Fahrenheit.

It was not noon, however, and so, alas, it was not yet time for the midday halt. Caught in this hollow where the wind did not blow, we plodded mechanically along the stretch of pebbles and white sand in the vibrating, burning heat of a flaming sun.

We halted at last, under the illusory shelter of an acacia, whose branches and spines only served as a slight filter to the fiery deluge. The asses were unloaded and they wandered away, an attractive little group, indifferent to the sun, to gather with the edges of their soft lips the blades of hard grass which shot up here and there between the stones. We looked for somewhere to lie down out of the reach of the dazzling rays. Then we drank. At last. . . .

The *gaila*, the siesta of this region, passes slowly. Louis sleeps, his torso bare, his hat pulled over his eyes. His black beard has grown very thick since we set out, so has the silver-grey one of Jacques. I pass my hand over my chin. Br-r! A trio of escaped criminals, that's what we must look like. Friday and his brother are also transformed; their splendid red covering has gone, washed off by sweat. It is so hot that they have taken off their loincloths, light as they are, and squatting, completely naked, under the thorny parasol, they tell each other interminable tales. But the Askari will never remove anything that denotes his superior position—shorts, shirt, forage cap with sun-curtain at the back, the khaki uniform of one of Her Majesty's soldiers. Seated on a boulder, his knees high, he polishes his rifle.

At last, at nearly three o'clock, the sun allowed us to set off again—or rather, to begin preparations. The animals had to be collected, the loads arranged, the whole thing done all over again two or three times, and we were worn out and irritable before we could resume our journey an hour later over the

stones. Since we had had a chance to drink, our thirst had become insatiable; our minds were now obsessed by the idea of the inexhaustible water of the lake. How magnificent was the prospect of having, that same evening, an entire lake to ourselves!

But night overtook us while we were still marching in the dry bed of the watercourse. We had no choice but to camp where we were. A few thorn boughs lay around and we lit a fire; we drank tea, gallons of tea and ate, without much enthusiasm, our ration of two rye biscuits and a piece of cheese. Then the wind rose and swelled, descending in gusts from the mountains towards the bottom of the Rift. We were lying on our backs on our canvas beds, tranquilly eating our portion of dried fruit, drinking our burning tea. And then, in the eastern part of the sky, we saw the stars begin to vanish, blotted out by the rising of a large, dark cloud.

"The rains," murmured Richard.

"Mm."

We were uneasy: the rains here can be a terrifying affair. Sometimes they don't fall for several seasons, then they beat down with the violence of a cataract. In a few minutes the dried-up beds are filled with rushing tides which thunder downstream in a foaming tumult, sweeping along everything that lies in their path. Even if you are not actually in the rain itself, you can be caught in the avalanche of water which swoops down from miles away, in the mountains. The thought of it frightened us, and the idea that the torrential rains expected in the south might cut off our vehicles from the return route alarmed us, too; meanwhile the whole of the east and all the south of the firmament had disappeared under our eye, swallowed up by the menacing darkness of the cloud.

To avoid the chance of a disaster we got up, and in the gusts and squalls which shook the night began the task of transporting our baggage to the steep bank which overhung the watercourse. We passed a rather troubled night listening to the distant rumblings of the thunder, until dawn the furious wind did not abate. At long last, it was day. Towards the south-east over the mountains, like massive and impregnable castle walls, a splendid cumulus rose whose firm white edges cut, very high up, into the marvellous blue of the sky. A magnificent sight, but not a reassuring one.

We had lost another day in our timetable; we were not yet at the lake; we would not reach the volcano before to-morrow. The rations were reduced to four biscuits a day, a sliver of cheese, two handfuls of dried fruit. The sugar and condensed milk went into the tea.

"We are not having enough salt," said Tormoz. "That's why we are so thirsty."

"What is there to have salt with? We should have brought spaghetti along." We had deliberately taken nothing that needed cooking, to spare the precious water.

"Don't talk about spaghetti!" said Jacques Richard. "With a thick sauce *bolognaise* and quantities of grated parmesan. . ."

"Hum!"

"About the salt," continued Louis, who did not readily abandon his ideas, "you can eat it by itself. The main thing is to have it in the system."

It was not a very appetizing prospect, but our friend was probably right. Each of us in turn swallowed a spoonful of plain salt. Nauseating.

In an attempt to put on speed, it was decided to leave Saturday with two of the asses and part of the luggage: the exposed films, a camera, a Leica, the worked flints, and half the provisions; these included the last three tins of orange juice and a can of water. During our absence, Saturday patched up the saddles to facilitate our return. Then we set off, hurrying through the hostile stones of the watercourse. Soon, fortunately, we were able to leave it to traverse a firm and level stretch against which the path showed clearly; it was a joy to walk along. In the middle of this flat area strewn with small rocky debris rose a big tumulus, a circle of enormous boulders, the funeral monument of a vanished people.

We were making our way down into a little ravine when suddenly our gaze was caught by a layer of white rock which cut in a striking fashion into the black basalt. We came nearer: it consisted of myriads of aquatic shells, not yet fossilized. Some kinds were easy to recognize—*Unio*, *Aetheria*, *Paludina*, certain tiny mussels and fresh water snails. Mingled with this profusion of molluscs we found the remains of fish, bones and spines, some of impressive size. We looked at the altimeter: 1,550 feet, three hundred feet higher than the actual level of the

lake. For thousands of years an inland sea had risen to this point, covering a surface twice as large as to-day.

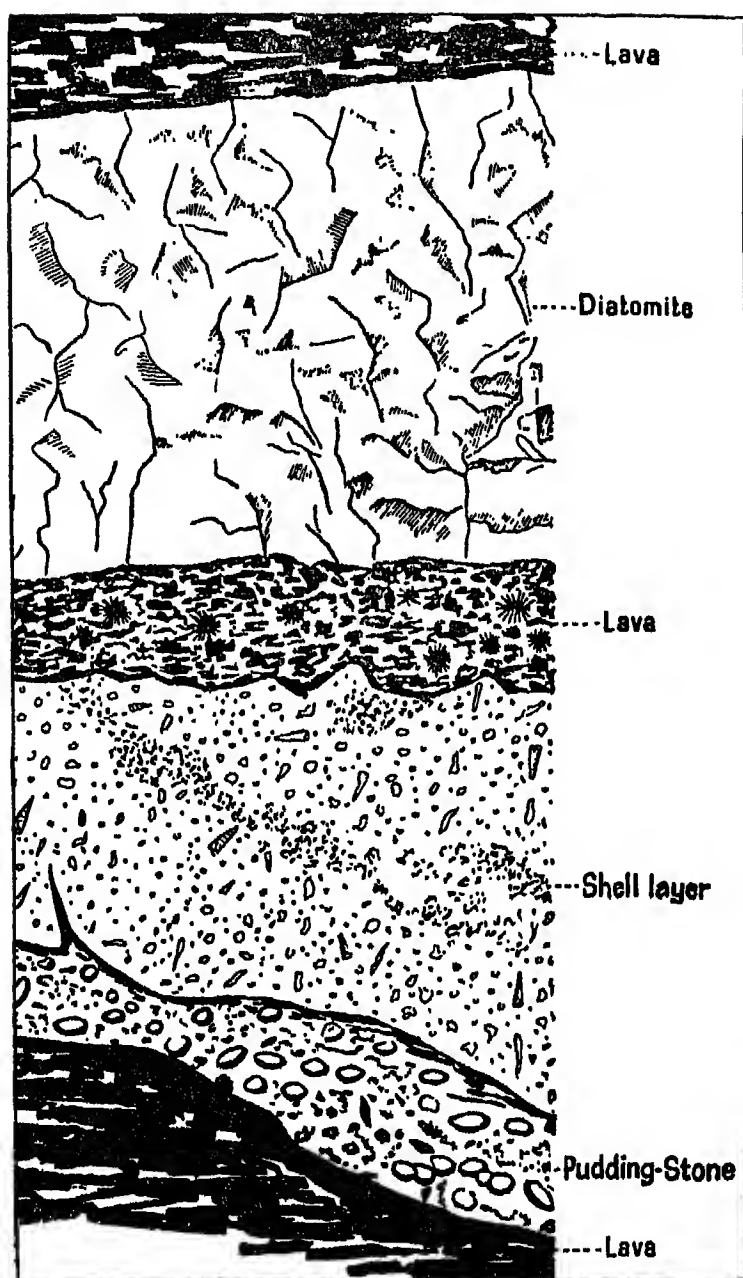
But the cross-section of the wall before us had a still more complex tale to tell: on a groundwork of black lava there was a layer of what is called pudding-stone, a conglomeration of rock and pebbles held together by clay. Over that was a layer of sea shells. Then came a thin flow of basalt, then a fairly thick one of diatomite. And over this, lava again. The lake had advanced, invading the volcanic country which surrounded it; its waves had swept along with them the stones of the shore, rounding them until they were turned into pebbles. Then these pebbles had been embedded in the clay, and over them, in the calmer and purer waters which now flowed over this bed, the molluscs and the fish, among them the enormous perches of the Nile, had prospered and multiplied. Then came a catastrophe; quenching all life, molten lava advanced over the bottom of the lake; and when life could start again in the chilled waters, only microscopic plants could flourish there, diatoms whose millions of tiny skeletons began to pile up over the centuries. Finally a new eruption took place, and powerful flows came in their turn to bury these two yards of diatomite¹ under a hard shell.

Richard and I refilled our specimen-bags and set off with energetic strides to rejoin our companions. We had not far to go; in the hollow of a little valley of light rock they were all three crouching down, leaning over something. Intrigued, we approached, and leaning over their shoulders we saw, at the bottom of a hole some two feet down, the shining miraculous surface of water. It was a spring which Friday knew, and called "Musiné", but of which he had said nothing to us. And such water! Deliciously cool, clear and fresh to the taste. It was not yet ten in the morning; we were not yet thirsty; but we carried away as much as we could, the water-cans as well as our stomachs filled to satiety.

As soon as you begin to drink, in the desert or up a mountain, thirst never leaves you. During the two hours which followed, we many times recalled that wisdom too often lies in abstention.

At present we could see the lake before us; there were no

¹ *Diatomite*, triploi or kieselguhr: an earth compounded of fossilized diatoms. It has numerous uses, as a refractory, a filter, a polish, etc.



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more peaks to hide it, but the absence of recognizable forms of landmark between it and us, the absence of scale, as it were, made it impossible to judge distances. It was only a sort of stumbling progress that we made down an incline strewn with great round rocks. These blocks were separated one from another by grooves a few inches deep, just wide enough to allow a foot to enter but not to let it leave without a painful wrench of the ankle. There was no alternative but to step from stone to stone, taking care not to slip. Then, under a burning midday heat that the hostile sun poured mercilessly down on us, yet sustained by the blue vision below which was to take the place of our present hell, we reached the lake. We did not stop at the brink; we went straight on in; and when the water rose to our knees we threw ourselves face downward into it.

Can you imagine it? You are lying in water and you drink in long mouthfuls, again, and again, and again. It is warm; it has a taste which is hard to define. Perhaps it is a little nauseating, but it is liquid. You feel that you are drinking the lake. You absorb it with all the surface of your skin; and when at last you are saturated, you turn over on your back and float in a state of languid bliss, all but your face submerged. Only now and then do you make the effort to glance about, to see if the eyes of a crocodile are not also touching the surface. It is the hottest hour of the day, but that no longer troubles you; there isn't an inch of shade, but there is water, within, without, all round and everywhere!

Chapter Twenty

THE LAKE IN THE DESERT

ON THE BLACK basalts of the shore we set up the tent to give some shelter to the photographic material. The heat had become unbelievably intense in spite of the great winds sweeping down from Kulal, and made us spend our time continuously either in the lake, or—and this we found was even better—in standing for a few short minutes on the bank while wind and sun dried our skins and brought a sensation of delicious coolness. We had taken off our clothes, stiff with four days' sweat, to wash them, and during this process went as naked as Friday and Saturday.

For hours we gazed at the stretch of water with the short stiff waves that rippled its surface, ringed by almost rose-coloured cliffs whose occasional sharp peaks spired out of the uneven summit-line. Straight ahead of us, about twelve miles away, a great mountainous island floated on the waters: South Island. Unknown country. English and American geologists had explored it during the thirties. They had spent two or three days on it while the rest of the expedition continued their climb to the north. Then, their mission ended, they set out once more, but no one ever saw them again. They were wrecked in one of the terrible storms that haunt Lake Rudolf, and all that was found of them, much later, was a hat or two cast on to the shore a hundred yards away.

To my stupefaction our asses, brought to the edge of the water, merely sniffed at it with a dubious air. They turned away, patiently seeking among the hard dry stones some hard dry plant to browse on. The wisdom of their instinct is magnificent. They had drunk at the hole of Musiné and they scorned this brackish water we had been swallowing, and which was soon to make felt its laxative effects.

When the time of the greatest heat had passed we folded

the tent and packed the equipment on the beasts. Taking with me a large bottle made of some plastic material that my friend Kufferath the chemist had confided to me so that I could bring him back a sample of Lake Rudolf to analyse, I went off to a spot about a hundred yards away, where the cliff sides plunged perpendicularly into the lake and where, I thought, the water would be as little polluted as possible, and collected the sample with a ritual solemnity.

After once more passing over crest after crest beyond the black fields of recent basalt we found again the ancient path and at nightfall realized that we had reached the extreme south of the lake, and were on the edge of a very long bay. Several miles in length, but only a hundred yards wide, with absolutely parallel sides, this inlet was clearly the result of a caving-in between faults of the terrestrial crust.

The place we were in was called Lotarr, as we learnt from a huge, gentle-faced Turkana, whose *manyatta* lay a hundred yards from the shore and from its crocodiles, which are particularly numerous in this bend of the lake. On the other side of the bay rose the perfectly-shaped truncated cone of an extinct volcano. It was called Nabuyatom—the place of the war-horn. We decided to camp there for the night.

The next day, after our two biscuits and the last of the cheese, after the infernal spoonful of salt and the large mug of sweet tea, we set off, accompanied by Lacedemon, the taciturn Askari. Saturday was left in charge of the tent, the asses, and the rest of the luggage. It was a matter now of speed or nothing. The provisions were almost completely gone and we were just beginning to feel the weakening effects of the severe rationing we had been obliged to impose on ourselves for the past few days. So far, nothing was wrong, but one or another of us might collapse if the strain and the under-nourishment were to continue much longer. Teleki *had* to be reached that day; we *had* to go and come back before we rested for the night. We marched rapidly towards the south on the fairly easy ground of a *laga* bed overlaid with volcanic ash.

The day advanced, but for the first time the sun did not appear: a veil of grey stratus cloud protected us, covering all the eastern half of the sky to a line exactly over our heads. Towards eight o'clock, it even began to drizzle slightly. I feared

that the celestial flood-gates might be about to open, but soon the mild rain ceased and the sun gradually peered out of the edges of the cloud. The fear of a heavenly deluge now turned into fear of the heavenly fire! A little after nine o'clock we climbed the steep side of the fault which bordered the *laga* and saw, from the top of the crest, only a few miles away and straight in front of us, a powerful mountain wall crossing the Rift from east to west. On this dark base several cones stood out sharply: one of them, as much from its look of life as from the recollection of Champion's photographs (which were taken, incidentally, from the opposite side), we recognized as Teleki itself.

Our goal was in sight. The ground between us, alas, was becoming increasingly difficult again, though our new-found certainty of success still made us put on speed. The sun, too, had returned to the attack. Now on the left, now on the right, we passed several minor volcanoes extinct for many centuries judging from their appearance—from the rusty look of the rocks, the traces of erosion, the stunted vegetation which partly covered the sides.

We had rapidly been gaining height and we were now on the foothills of the barrier. The ground was covered with slag and cinders, larger and larger in size; this meant that we were approaching the crater which had vomited them, and we found ourselves following a twisted flow of lava stretching out to the right farther than the eye could carry. The volcano was near. Suddenly I felt a slight uneasy shock. This cone, which seemed about three hundred feet high, had little trees growing out of its sides—something like leafless apple trees; I might have been looking at an orchard in midwinter clinging to the side of a hill of the Jura or the Cevennes. If there *were* trees or bushes of such size and in such numbers, the volcano could not possibly be less than a century old. In this terrible climate vegetation takes root only with extreme difficulty. Which, then, was the volcano that Teleki had seen in activity?

We crossed the dreadful tangle of twisted slabs, sharp-edged and brittle, that had once been liquid lava, reached the foot of the cone, and began to trudge in zigzags up the treacherous slope of grit and ashes which led to the summit.

It must have been about eleven o'clock when we shook hands at the top, on the edge of a steep-sided crater dangerously

littered with loose stones. We had reached at last the end of our long road. An immense panorama unrolled beneath our eyes. Vast fields of black and grey lava filled the entire bed of the sunken Rift as far as the distant lake. Beyond, marvellously blue, the surface of Rudolf stretched to the horizon, framed intermittently by the line of tawny cliffs. Behind us, the dark and massive barrier rose nine hundred feet higher still, above our heads.

My last doubts were dispelled: what is known as the volcano Teleki did not have the eruption that Teleki, or rather his companion the geologist von Höhnel, described. In fact, the great flow of lava did not come from the cone on which we were but from a conduit that we could discern at the very foot of the barrier. The flow had descended straight on to our present pedestal, which had caused it to divide into two arms passing to the left and right. Lower down, the flows had spread out to form the gigantic chaos which had driven back Teleki. The eruption was the result of a fracture suddenly opening between the conduit and a point beyond our cone, which had literally been split in two. It was this fracture which had given the old extinct well a fallacious appearance of new activity. The so-called Teleki belonged to a much earlier period than the supposed Teleki eruption—and those which have occurred in this chain since then have had no connection with the ancient cone. We perceived in the plain, for instance, a flow of greyish colour which descended from the south-west and which, cutting across the other, was evidently of more recent date: the 1921 eruption, perhaps?

From the height of our observatory we could see clearly that all the fresh lava proceeded from the median part of the Rift, that this alone still showed an eruptive activity which seemed practically extinct everywhere else.

The geologists who have studied central-eastern Africa have agreed that volcanic activity began there some 75 million years ago, towards the end of the secondary era. It began with almost interminable emissions of lava escaping through long fissures, without which no cone can be formed. (This kind of eruption has become very rare in our time; the only one known, in fact, is the catastrophic one of Laki which ravaged Iceland in the eighteenth century.) Extremely vast surfaces were thus

covered over, and it is these which formed the immense fractured plateaux to-day of the Rift. Some twenty million years later, in the dawn of the tertiary era, gigantic volcanic mountains very gradually rose up. In East Africa, at this period, a number of mountains were born: Mount Kenya, the Aberdare group, later, Kilgon, and, in the centre of the continent, Kahuzi, Mikeno, Biega.¹ Another twenty or thirty million years passed while the faults of the Rift began to appear, and the resulting great furrows, accompanied by new and abundant "fissure emissions". These faults have since continued to develop, sometimes in violent fits and starts, by a process of suddenly renewed erosion, as in the split-up canyon we had seen in the valley of Laisammis. Later, at the beginning of the quaternary era (only three million years ago, that is), new volcanic cones were formed: Kilimanjaro,² the highest point in contemporary Africa; Suswa, later Longonot in the east; the giants Virunga, Mahavura, Karisimbi in the west. Finally, the active volcanoes that we know appeared in the course of the last few thousand years: Nyamagira, Nyiragongo on one side, and on the other Oldonyo Lengai, Meneugai, Teleki (whose Turkana name, Champion had said, was Nagira-Mwaiten, which means "the place split in two").

It may be seen that, apart from a few rare exceptions such as Kilimanjaro—exceptions which were probably due to the existence of important fractures either of a perpendicular kind or slanting in the direction of the Rift—the oldest volcanoes are the farthest from the centre or axis of the Rift, while the most recent lie *towards* the centre.

This powerful barrier on the foothills of which we were standing, recalled somewhat that other barrier across the western *graben*, formed by the volcanoes of the Virunga chain. By preventing the passage of its accumulated lavas to the river which descends from the high mountains of Ethiopia, the barrier has determined the formation of Lake Rudolf. In the same way, by blocking one of the sources of the Nile, the

¹ Becoming less effusive but more explosive, the eruptions hauled out into the air millions of tons of rocks; these, accumulating round the orifice of the volcano, contributed (alternately with the lava flows) to the construction of the mountain.

² Contrary to current opinion, Kilimanjaro is not an *extinct* but a *dormant* volcano—like Vesuvius.

Virungas engendered Lake Kivu. Here, as there, new peaks are sporadically born, satellites of the great volcanoes.

This activity, almost wholly concentrated along the centre of the vast furrow, is actually linked with the ultimate caving-in of a narrow vault or arch yielding to opposing forces in the terrestrial crust. And if we could remove from the Rift all the material which has filled it up as it has deepened, lava and other sediments, we would probably find a profile very like that which we traced of the Red Sea bottom during our *Calypso* voyage.

Already the sun was moving through the high regions of the sky: it was time, more than time, to start the journey home. On the little summit we built up a cairn of old volcanic stones, then, with great leaps, we raced down the slope. But it was not possible to resist the temptation to pause once more, every time we came across a volcanic stone, and break it with a blow of the hammer in the hope of discovering inside it, as occasionally happens, some piece of a different rock, some witness of the mysterious depths, torn from the lining of the volcanic conduit. All the hammer blows were in vain, however, and served only to delay us still more.

It was nearly noon, the hour when the traveller should take shelter if it is possible. In these fields of black lava the heat had become unendurable. But if we stopped at all it was to break off a piece of basalt and put it in the bag, to take a photograph, to make a note; and then we went on. Each walked alone, each occupied with his own thirst, his own fatigue, with his private dreams of the tent, the tea, the camp too far away. The heat shimmered in the air as if over red-hot metal. The distance had lost the sharpness that was usual in the African landscape. Even the touch of the wind was intolerable: it might have come from an oven.

And now the soles of your feet are burning through the shoe, for the blue-black rock on which they tread has held and absorbed the fire. You long to hasten your steps, but fatigue makes them slower and slower.

Hours, centuries pass; still you move foot after foot through the furnace. The last of the white cumulus clouds has evaporated; now there is nothing between you and the oven-lid of a

sky but the vibration of the scorching stones. With an effort I shut my lips, but the torrid air still drives at my tongue and the roof of my mouth; these are no longer damp and supple flesh, but an enemy substance—tinder, cotton-wool, withered, dry, dry, dry. . . . Somewhere, water exists, torrents in the Alps, springs of cold water flowing all day long, all the year round in the Savoy villages. I hear those waters sing, the fountain falls in the great stone basin and splashes you with its spray; and the tap not properly turned off in the kitchen, I hear that, too. This tortures me. So much coolness, so much good water idly, wantonly lost.

I was the last to arrive. For a long time I had seen the tiny orange patch that was the tent. It had given me courage. But I had marched, marched and it was never any nearer. Then, the sight of it had exasperated me. Another step, another step, another. Surely there ought not to be so many more miles? Sheets of liquid fire descended from the sky. . . .

Suddenly the tent was no more than a hundred yards or so away; I saw Jacques and Louis sitting at the water's edge. They were probably drinking. And when I knew at last that there would *be* something to drink, I realized that my thirst was not so unendurable. I had been thinking too much about France, the good ploughed earth, the Alpine snows, the flowing streams, and I felt a vague nausea at the remembrance of the warm and sickly water of the lake. I recalled that it was not so bad when taken plain, but that in the form of tea it was horrible. No, I could not have been so thirsty, since I then passed a quarter of an hour creeping about trying to film the birds which abounded in the marshy extremity of the bay: ibises, flamingoes, storks, Nile geese. Finally, I rejoined my companions. They were sitting on the ground at the edge of the bay, beside a hole in which they had dug to filter the water which was particularly foul at this point: sometimes they were drinking the warm, salty stuff with little sips, sometimes they were soaking their linen shirts and putting them on again immediately afterwards.

"Wonderfull! We haven't been so cool for months!"

It was true; I had the same feeling, at once delightful and excessive, for the extremely rapid evaporation of the water absorbed by the cloth made us actually shiver. These shivering

fits became so disagreeable that we finally abandoned the role of evaporating jars to seek a little shade instead. But where, in this desert? Inside the tent? There, we could have roasted a joint. In the water, as on the previous evening? Here it was almost opaque, thick with plankton and swarming, moreover, with crocodiles. Richard had the brilliant idea of setting up our camp beds and using them as a shelter from the sun; in this fashion, each behind his private screen, we passed the last burning hour of the day. It was about 129 degrees Fahrenheit in the shade. Later, when we were back in Europe, Jacques Richard (who had spent twenty-six years in the tropics) said to me: "I have never experienced such a heat. I thought I was going to die!"

Towards the middle of the afternoon our neighbour the Turkana came out of his hut and started to fish. Incredible fish they must have been to live in this incredible water—yet it was really teeming with them. If we had not seen what happened we would not have believed it; indeed, during the first few minutes we were asking each other: "What does he think he is doing?" He was standing, tall and loose-limbed, on the very edge of the bank and nonchalantly casting into the water a large harpoon, fastened to his wrist by a cord of long, twisted fibres. Then, without the least haste, he drew the thing towards him, grasped it, brought his hand to the level of his ear, threw the harpoon again, still with the same indolence; repeating all this patiently until the moment when, instead of bringing it back empty, he drew forth an enormous fish, flapping desperately, a splendid *Tilapia Nilotica*, one of the most delicious fish in Africa. We were astounded. This extraordinary procedure, this casual harpooning in completely opaque water, proved—if nothing else—the fantastic wealth of fish life in the lake. It was not surprising that crocodiles were also plentiful. They seemed to be everywhere, sleeping on the bank with hideous gaping jaws, crawling or floating, with only their eyes and nostrils touching the surface of the water. If we—and they—had not been in a part of the National Park, we should not have hesitated to use our fine Magnum Mauser.

"Shall we ask him to sell us his fish?" suggested Tormoz.

At the very idea, my mouth watered so much that I could hardly speak. Richard answered, looking round for our guide.

"An excellent thought. Where's Friday? He can inquire for us."

But Friday had gone to fetch the asses who were eating, somewhere or other, their ration of chaff and stones. It was then that the tall Turkana approached us rather hesitantly, but with a very pleasant shy smile, and held out his fish at arm's length with a gesture of hospitality.

We ate it. A new delicacy, offered to anyone who has been living on a couple of biscuits and two handfuls of dried fruit a day is well calculated to arouse the most heat-jaded appetite. Now, we had fish. It melted between the fingers; we filled our mouths with the luscious, oily, warm, rather salty stuff.

The sun was already low in the west when the animals were ready and we could set off again. I felt a slight pang at leaving our friend the fisherman. We had nothing to offer him as a gift, and Richard gave him a few coins. Squatting on the ground, the Turkana took them, looked at them in perplexity, turned them over and over, and gave us an inquiring glance: this man who had never seen white men before knew nothing about money, either. Friday began to laugh to himself and threw us a conspiratorial look: "Those savages!" Then, with kindness, as if to a child, he explained: at South-Ilorr, beyond Mount Nyiru, was a Somali merchant's shop; there the fisherman could change these coins for whatever he wished, rope or grain or seeds, harpoon barbs or maize flour. Our benefactor listened. He did not say a word; his expression remained pensive, rather distant: nothing at all of what was said seemed to touch his imagination.

We were perplexed. We would have liked to do something to please this man whose hospitable kindness had moved us so much. Tormoz checked the loads, threw his customary attentive glance about the place to assure himself that everything was in order and nothing forgotten. Then he picked up something and held it out to the fisherman, whose face suddenly brightened. His smiling glance darted from us to the marvel that he held tenderly between his palms: the empty condensed milk tin.

And so we came back, through the bitter desolation of the wastes of stone. We had found for ourselves the ancestral

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rhythm of the nomad, and day after day we advanced along rivers filled with sand, by the slopes of tabular mountains cut with gorges, through vast plateaux glittering with black stones. We felt rich with the strange unburdening wealth of the desert wanderer, the peace and serenity of the nomad of the steppes for whom, naked of possessions, no problems exist but the fundamental ones of daily survival. We did not even think about water—we knew that there was water on our path, at Musiné, at Lisammis, at Lonjerin. Freed from anxiety, freed from Rudolf, freed from Telcki, we felt the deep untroubled animal assurance of flocks moving from one pasture ground to another.

We heard only the wind, the great untiring wind of the steppes. In the hot hours of the middle of the day, the *geila* was taken under the meagre shade of a spiny shrub. Then the regular pace of the march was resumed until night. I remembered the halting places in the Adrar district of Mauretania, the swift trot of the racing dromedaries, the sinuous Moors, with dark blue turbans, glittering eyes, their joyful, rather wolf-like laughter. Each, with his bare foot, incessantly urged on his beast with little sharp taps at the base of the neck. At nightfall the race was suddenly brought to a close; the animals were given their heads, some moving to the left, others to the right, and the men leaped down, light and rapid shadows in the dusk. Now, renewed each hour, came the miracle of sweet and burning hot green tea. One ate, almost religiously, from the dish of rice cooked in rancid ewe-milk butter, then, rolled up in a cloak, and, stretched out on the sand or the rock, became lost in the marvel of a sky flooded with stars, over which sailed the fine silver boat of the moon.

Here there were no camels and practically no more food. The resting places were hard; you were tired out after so many hours of baking rock. But in spite of the sensation of hunger, perhaps because of it, we felt like real nomads, more and more identified with the desert itself, with the migrant's rhythm of regular and eternal wandering.

Everything in the region cries out silently: *Life is the exception, absence of life the rule*. Between the mineral absence of life and the organic death, what time, what room is there for the spirit? Among the parched sands and the rocks you become

aware of the power and the quality of death. Little by little, you surrender to it entirely, and with calm. On the surface of the earth's enormous mass, whose vastness can only be realized in places like this desert, life is a fleeting image made in the sand, which a sweep of the arm could brush away. In our European countries everything is a defence—the streets and trees, houses, trains, gardens, fountains, work, pleasures, human relationships, ambition, money, art. Even words themselves, because of the constant usage that we give them, have lost their original power to strike us with awe and dread. "*We are all mortal.*" No one is afraid to say these words, or to hear them. But it is a little phrase that one scarcely dares pronounce in the desert.

During this long march which was bringing us back to the civilized life we knew, I had fallen quite naturally into the reflections which I had known a year before in the vast plains of the Adrar country—thoughts of the omnipresence of death, the human desire for consolation and hope. And there was consolation to be found, in the power and joy of love—the love of a mother for a child; the love of a man for a woman; the love of sons and daughters for those who have engendered them and brought them up to adult years; the love of workmen for their work; the love of creation or knowledge; the love of any man for his millions of fellow men and women who struggle and suffer each day, all the world over, to create, preserve and foster the sentient being, that living miracle perpetually torn from the mineral universe.

Appendix

ULTRASONIC SOUNDINGS—SUBMARINE CANYONS—GUYOTS

PAUL LANGEVIN'S DISCOVERY that elastic vibrations could be transformed into electric vibrations and inversely, so that thereby trains of ultrasonic high frequency waves (over 20,000) could be produced at will, has developed into an astonishing technique of ultrasonic sounding. Instead of several hours being needed to take a sounding of the depth at one point alone, from now onwards the thing can be done in a fraction of a second. What is more, the recordings are no longer spasmodic but continual, and the graph they leave on sensitive paper is an image, in fact, of that part of the sea-bed over which the ship has passed.

Until now, relief maps of the sea-bed have always been vague and speculative. They have been plotted from scattered depth-measurements taken by plumb-line soundings. What sort of relief map would be made of Europe if it were based on nothing but a few altitudes taken from a plane flying over a layer of cloud? Such a map could hardly have much relation to the actual facts. So it is with the maps of the oceans and the seas. I ought to say, however, that near to the coasts, in the estuaries and the approaches to the ports where the need for careful charting is always most urgent, the extreme density of the soundings has made our knowledge rather more precise. But this is far from being the case with the Red Sea, for instance. Up to now, only one thing was known: on either side of a central furrow, the depths rose progressively to the African and Asian shores. But what form does this rising actually take? Surely, I thought, by means of continuous soundings carried out across the central line of the sea-bed, it ought to be possible to trace something like the original outline of important faults which were produced at the time of the first subsidence. For,

if ever a cavity of this kind were to be found relatively protected from the usual causes of being levelled down or buried, it should be in the Red Sea. First, the marine depths are not subject to the destructive erosion of land surfaces exposed to the air. And here, moreover, the primitive profile has had every chance of *not* being covered over by the sediments which accumulate at the bottom of the lakes and inland seas lying in other rifts of the globe, since no river pours alluvial matter or mud into this sea. These reflections led me to beg Cousteau, a master technician of echo-sounding, to take a series of bathymetric graphs in parallel lines from east to west and from west to east, in the hope that they would give us an idea of the structure of the rift. Furthermore, it might be possible that a north-south crossing along the coasts would give us the chance of tracing some under-water canyons with our echo-sounder.

The submarine canyons, battleground of oceanographers the world over, provide one of the most controversial geological problems that our ancient planet has to offer us. Already in the last century one or two of them were known about. But they were looked upon as very rare exceptions, and no one paid them much attention. Gradually, however, others of the same kind were discovered, until finally the echo-soundings taken over the last twenty years showed that, far from being exceptions, these under-water gorges were, in fact, the rule. Now they are being studied with meticulous care: they are a source of exact topographical detail and an object of considerable speculation about their origin.

It is certainly true that they have exactly the look of those deep and relatively narrow grooves that torrential rivers hollow out in mountainous regions: the same V-shaped cross-section characteristic of "young" rivers, the same average slope of five, six or seven degrees. The "source", the head of these sea-bed valleys, is to be found at a fairly shallow depth, and is often even linked with a river-bed existing on dry land. But the most astonishing thing is that their lower termination or "mouth", lies far below at depths of 3,000, 6,000 and even 10,000 feet. How is the formation of these submerged rivers to be explained? If, again, such canyons are only to be met with off "young" coasts in a state of relatively violent upheaval, like the coasts of the Pacific for example, one could easily imagine

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that such engulfings are due to powerful rocking movements, since it has now been proved that the highest summits of the globe, such as Everest, the Ruwenzori or the Matterhorn, are made of sediment, accumulated millions of years ago at the bottom of deep seas. Unfortunately, these under-water canyons are to be found everywhere, as much in the Pacific as in the Indian Ocean, in the Atlantic as in the Mediterranean. The explanation of this by tectonic motion cannot hold for all the valleys over all the seaboard of the globe, for geology has taught us that such upheavals are always localized and never universal. If at least one could say that the canyons were hollowed out at different geological epochs. . . . But no, it seems indeed that these valleys all date from a very recent epoch, for dredgings of the walls of a number of them have brought to light fragments of rocks of the end of the tertiary era which prove that the hollowing-out is later than this period. It is even possible that they are of the quaternary era, that is to say that they are hardly a million years old.

If we accept the theory of the simultaneous formation (geologically speaking) of these submarine rivers, must we likewise believe that the seas all ebbed at certain times until they laid bare stretches of land which to-day are buried under a mile or so of water? Numerous oceanographers, shocked at the idea of such a draining process, have performed miracles of ingenuity to find a theory explaining that the hollowing could have come about not in the air but under the sea: currents accelerated by an acceleration of the earth's rotation, "dense" currents whose erosive power has been increased by particles of clay, faults in the earth's crust opened out by artesian springs, etc. None of these hypotheses can stand up to analysis. That of the fall in the sea-level remains the only acceptable one; but even this is no longer proof against all the tests.

First of all, where would the colossal quantity of water have lodged itself—water representing a two-mile drop in the depth of the entire oceanic surface? Unless we assume that the lowering of the level took place at a time when the land masses bulged outwards so that the marine depressions became deeper still, the most plausible conclusion is that an important glacial spell, which covered the high latitudes with gigantic caps of ice, managed to immobilize millions of cubic miles of water. But

how can this be assumed when those enormous ice-caps failed to prevent such valleys from forming as far to the north as Kamchatka and even the Aleutians? And what of the Mediterranean canyons? If the waters of the seas receded by no more than 1,500 feet, the Straits of Gibraltar would run dry and the Mediterranean would turn into a lake. But the Mediterranean canyons are more than 28,000 feet in depth.

The disappearance of the water might, of course, be due to an extreme *evaporation* which would have enveloped the globe with a formidable layer of cloud. The violent deluges brought about by such a process would have contributed powerfully to the hollowing of the canyons. But one must find some evidence, a *paleoclimatic* proof of such a phenomenon.

Thus nobody has been able so far to justify irrefutably this theory of a prodigious draining away of the oceanic waters. There are some exciting suggestions put forward, but none of them entirely accounts for the occurrence. So far as the hollowing of the canyons is concerned, it does not seem possible to deny that a fantastic draining process took place in the late tertiary or the quaternary era. This laying bare of the slopes and banks which separate our shores from the marine abysses, this abrupt lowering of the level of the base of the continental watercourses, must have brought about a very drastic erosion which, in the very brief interval between that time and our own, would have hollowed out valleys of Alpine type all round the continents. The same theory would account, moreover, for the strange coincidences of fauna and flora that are found to-day on lands separated by thousands of miles of salt water—Guinea and Brazil, for instance, or Deccan and Mozambique, coincidences that cannot be explained by any of the existing theories apart from that of the continental drift of Wegener. This last, however, if satisfying from many points of view, seems equally impossible from others; while if we admit that the level of the oceans was lowered by two miles, it would follow that, for example, South Africa and the Argentine would find themselves linked between Walfish Bay and Rio de Janeiro, and that Guinea would be linked to Brazil by that narrow arm of the sea about 25 degrees of longitude west and 5 degrees of latitude north. Thus, the animal and vegetable migrations could have come about easily.

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This hypothesis, if it were confirmed, would permit the clearing up of another oceanic "mystery", that of the *guyots* of the Pacific—the submarine mountains which lie at a great distance below the surface. They all have the same shape, that of a truncated cone with a wide, circular, horizontal summit. These summits are all to be found at a uniform level, between 4,200 and 4,500 feet down. The existence of some of these cones was known before the last war, but little importance was attached to them. They were looked upon simply as submarine volcanoes. Then, the numerous ultrasonic soundings taken by warships in the Pacific between 1940 and 1945, revealed a profusion of these *guyots*. But what really roused attention was the discovery that not only did they possess no craters but that their flat summits were practically all at the same depth. It is certainly curious that *guyots* have not been encountered in other oceans, but less so when we remember that we are only at the beginning of the oceanographic era, and that research on *guyots* themselves is hardly more than a few years old. Furthermore, the Pacific is in a special position, for this ocean contains the greatest number of risen or submerged volcanoes in the world. Compared with other oceans, again, it possesses a far more regular sea-bed.

In the Red Sea, in any case, there is little hope of finding *guyots*, for this sea, even more than the Mediterranean, would be reduced to the state of a lake by the least lowering of the general level, the shelf to the north of Bab-el-Mandeb being less than 500 feet deep. What chiefly impelled me to undertake these crossways soundings was the hope of finding preserved under those untroubled waters the original structure of the central cavity, and that alone made worth while our several days' journey zigzagging from east to west.